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The Oldest American Aeronautical Magazine

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Action picture of a Bellanca "CH," powered with a Wright "Whirlwind" engine.

VOLUME XXV

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Special Features

Building the R.101

Problems of Aeronautical Training

Controlling the Overhead Expenses

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Vol. XXV DECEMBER 29, 1928 No. 27

The National Show

THE recent International Aeronautical Exposition in Chicago was the result of the co-operative efforts of the aircraft industry, acting through the Aeronautical Chamber of Commerce. It is very gratifying to note that the show was highly successful. Almost all the exhibits were put on by manufacturers, rather than by local dealers, and almost all of them feel that their efforts were well worth while. It is estimated that from $4,000,000 to $5,000,000 worth of planes, engines and accessories were contracted for by distributors. This is a very definite and tangible result, but even more important were the contacts established.

It is to be hoped that the Chicago show will establish a precedent for the holding of one national exhibition each year. This does not mean that there will not be important local shows, or does it mean that the national show will have the greatest public attendance. It does mean that the dealers and distributors the nation over should know definitely that there is one important gathering each year that they should attend.

There will be room undoubtedly for several large shows every year, but one of these should be chosen as the show when the manufacturers meet with their distributor organizations. The generally acknowledged success of the show put on by the industry through its own exhibition company would seem to point the way toward the formation of such a policy, which would be of great benefit to all concerned.

The best time and place for the national show is a difficult problem to solve. The majority of those at Chicago seemed to favor the late fall, or early winter as the best time for a national show. It was argued that local shows could best be held in the spring, which was the best time for sales to the public, but that the national show, being largely for the benefit of the manufacturers and the distributors, should be held at the time that would do them most good. The fall, or early winter show would give the manufacturers time to construct the models for the next year after the rush of summer business was over. At the same time it would give them an opportunity of changing these models before the spring, if some of them did not seem popular with the dealers and the public.

It does not seem as though the place for the national show would have to be the same every year. The most important requirement is that of finding space sufficiently large to accommodate all the planes, which it is desired to exhibit. This year, not only were many planes turned away, but also the space was so crowded that it was difficult to obtain an unobstructed view of the planes from a distance great enough to get a real impression as to their appearance.

The national automobile show is held each year in New York City, which is still the center of the most densely populated section of the United States. However, it is not probable that that section will be as profitable a market for airplanes as it is for automobiles. Although flying is a year-round occupation or pastime, climatic conditions do play an important part in the number of sales in different sections of the country. This fact is proved by the greater number of planes to be found in the Middle West and the Far West than in the East. On the other hand, it is quite possible that future designs will eliminate the part that weather plays in sales, and place the East on a par with other sections. Therefore, perhaps it would be a good idea to permit the various big cities to bid for the national aircraft show in a manner similar to the way they bid for the National Air Races.

Mobile Inventory

THE manufacture of planes for the commercial market is of such recent date that the industry can be well excused if it has not been able to completely solve problems which have bothered the most experienced manufacturers in other lines. One of the most serious of these is the matter of inventory. In other industries the amount of inventory or stock of raw materials which should be kept on hand has always been a very big problem. There has been a very decided tendency in recent years not to order material far ahead and not to pile up a big inventory. Careful systems have been worked out showing the amount of material needed for various demands of the finished article and orders have only been placed at the last moment when the demand was already fairly evident.

There are several difficulties in the proper functioning of such a system for the aeronautical industry but even a partial functioning would be well worth while. The difficulties lie in the fact that many of the raw materials are not kept in stock by the producing firms, but are made only on special order and therefore must be ordered by the airplane manufacturer far ahead of the time it would take to fill orders in other industries. Also, the design of planes has been changing at a considerable rate and few manufacturers have their plants sufficiently systematized so they can tell exactly what materials will be needed to fill a given demand.

Intelligent effort in keeping down the material which is kept in stock would place the manufacturer in a much more sound position. As both demand and design are such uncertain factors, shortening the period between ordering the raw material and selling the finished product would give greater assurance that little of the raw material would be wasted. There is not only a saving in interest and in capital requirements, but the shorter period may mean that the manufacturer will not be forced to continue producing a product which he knows is out of date.

Building *the* R.101

A Description of the Methods and Materials Used in Constructing England's New 5,000,000 Cu. Ft. Dirigible

By W. H. Sayers

THE two 5,000,00 cu. ft rigid airships now being built in England, though smaller than the ships recently ordered by the U. S. Navy, are far larger than any airship hitherto built in any country. They are moreover of special interest in that both embody marked departures from all previous rigid airships in the details of their construction.

The R.100, which is being built by Lieut. Commander Burney's firm, The Airship Guarantee Co., Ltd., is so far conventional that it is built throughout of duralumin, and employs transverse frames which, like those of the Zeppelin type, depend on wire-bracing in the plan of the frames for their rigidity. The girders used on this ship all consist of three booms, tubular in section, tied together by rivetted-on duralumin stiffeners not unlike those of the normal Zeppelin type. The tubular booms are made by twisting flat strips o fduralumin into a spiral with a slight overlap between successive edges of the strip, through which rivets are passed.

Use of Screwed Couplings a Feature

A feature which is quite outside the range of Zeppelin practice is the use of screwed couplings for joining consecutive lengths of girder together. The frame members are jig-built, require no fitting in place, and are easily removable and renewable in case of local damage.

The R.101, which is now being assembled at the Royal Airship Works at Cardington, Bedford, is however an even more radical departure from conventional airship practice than is R.100. In the first place steel has been used in preference to a light alloy for all the more heavily stressed components of the frame. Secondly the transverse frame rings used have no radial wire bracing, but are designed to possess sufficient inherent stiffness without such aid.

The abandonment of duralumin in main structural members was dictated by consideration of the unreliability of this material, particularly in regard to the possibility of intercrystalline corrosion, and by the belief that the recent developments in the manufacture of exceedingly light airplane structures made from high tensile steel strip would allow this material to be used without any increase in the structure weight.

The fact that even stainless steel could now be worked to sections of the required characteristics and that thus the corrosion bogey could be entirely overcome was a dominant factor in coming to this decision.

The reason for adopting the stiff transverse frame rings in place of the more usual type was that by this means the very heavy compression loads transmitted to the frame girders by the radial bracing when this was subject to unequal gas pressure in consecutive gas compartments, caused by either deflation of one bag or by a large angle of pitch on the ship as a whole, could be avoided.

The main frame girders of the R.101 in the erecting jigs

The general design of the R.101 is due to the Staff of the Royal Airship Works, a Government establishment, but in order to deal with the problems of detail design in a structure of so novel a type it was felt necessary to call in the assistance of a concern with the largest possible experience in the use of high tensile steel for aircraft structures.

As a result the firm of Boulton and Paul, Ltd., of Norwith, was asked to undertake the necessary design and experimental work, directed in the first place to exploring the possibilities of using steel for such purposes and in the second place to devising practical methods of manufacture.

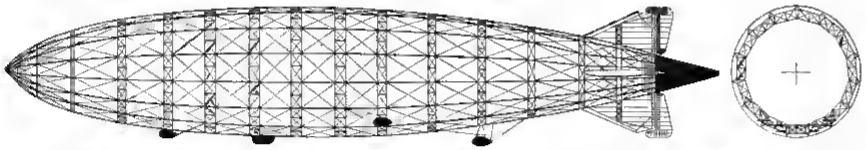


Fig. 1. Drawings showing the side elevation of the British dirigible R.101 and a cross-section of the hull

In 1924 Boulton and Paul designed and built a pair of experimental longitudinal girders with stainless steel booms which on test gave excellent results, and a little later they designed and produced a complete short section of the hull. This was erected and tested for the dual purpose of proving the practical nature of the type of construction proposed and of checking the methods of stress determination which had been developed for the design of the ship as a whole.

Finally the firm was awarded a contract for the actual design and construction of the whole hull framework including fins and rudders. This contract has now been nearly completed. The design work entailed in the production of this ship has been divided between the Royal Airship Works and the design staff of Boulton & Paul, Ltd., in the following manner.

The Royal Airship Works was responsible for the external form of the ship, the disposition of all loads and all aerodynamic and aerostatic qualities. They prepared a frame diagram, wherein each member of the frame was indicated by a line, and determined the stresses, under conditions framed by the Government Airworthiness Department, in each member so shown. Boulton & Paul, Ltd. had then to design from this data suitable structural members to take the place of the line members shown on the frame diagram, together with all necessary joints.

Erection of the frame was to take place at Cardington 70 mi. distant from the works where the members were to be manufactured, and it was required that all joints be made by close fitting bolts, and that no fitting should be required in process of erection. Owing to the enormous size of the ship, trial erection of such items as frame rings at the makers works was impossible.

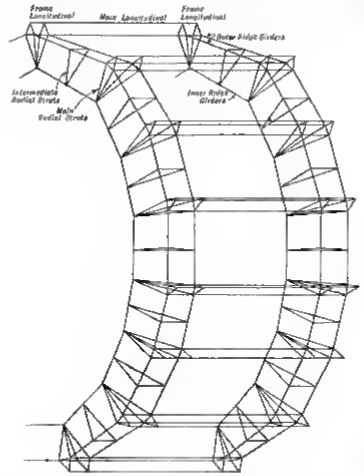


Fig. 2. A sketch showing the arrangement of girders in the hull frame members of the R.101

Moreover the form of the ship's hull is one derived mathematically from an ellipsoid, has no parallel section, and is of constantly changing curvature, so that the angles of intersection of longitudinal members with transverse frames differ at every frame in the length. Under the circumstances extreme accuracy in both design and manufacture of the components was essential, and a great deal of ingenuity had to be expended in so laying out details that the cost of jigging and tooling could be kept to within reasonable limits.

It was decided that the only practical method of computing the dimensions of individual members, angles at joints, and the like was to work them out from the equation of the hull curve. It was considered important that the curvature of individual sections of the main longitudinal girders should correspond accurately with the designed contour, which involved differences in length between inner and outer booms of the same girder of the order of a few thousandths of an inch, and the computation of these small differences involved the working out of dimensions to fifteen significant figures.

The benches used to draw the closed joint, stainless steel booms of the girders in the new British dirigible

This immense labor in the design office has in fact been amply repaid in the course of production and erection. Over 500 ft of the hull frame has been erected at Cardington without a hitch in the space of a few months, and no parts have been rejected on account of design errors.

It would be possible to write almost indefinitely concerning the details of this remarkable achievement but it is necessary to confine this note to a general outline of the more striking characteristics of the methods used in manufacture.

R.101 is approximately 730 ft. long and has a maximum diameter of a little more than 130 ft. Over the greater portion of the length, the section is a polygon of fifteen sides. At the tail, the section changes to 16 sides. There are eleven main transverse frames with two lighter nose frames, of 15 sides each and three 16 sided frames at the stern. Each of these frames consists of three sets of girders, known as "ridge girders," arranged at the angles of a triangle, two toward the outer surface of the hull and one, some 10 ft. toward the center line. These three sets of girders are tied together with "radial girders" and by short sections of longitudinal girders to form a ring-like structure, triangular in section. The general scheme of the arrangement of these girders is shown in Fig. 2.

The longitudinal girders are in sections—each about 45 ft. overall, to fit between the short sections of similar girders which form part of the transverse frames.

Each nearly rectangular panel of the hull, formed by two adjacent longitudinals and two adjacent frames, is

cross braced by steel cables, and all panels in the frame formed by "ridge" girders and longitudinals are similarly cross braced

The individual girders of this hull framing are themselves triangular in section. The main longitudinals have booms of stainless steel, drawn, to a closed-joint tubular section, from flat strips in the annealed condition, and are hardened and tempered after forming by a special process of continuous heat treatment. These tubes are of large diameter and thin guage—2¾ in. O.D. x 20 S.W.G. (.036") or therabouts,—and can be produced in lengths up to 70 ft., straight and true, in a material of an ultimate tensile strength of about 90 tons per sq. in.

The three booms of each girder section are united by struts of a similar close-jointed tube and by swaged-rod cross-bracing, the assembly resembling that of a normal wire braced airplane fuselage. Aluminum silicon alloy die-castings form the strut sockets. These are a push fit on the tubular booms, and are secured thereto each by one stainless-steel bolt which also serves as a pivot for the steel shackles into which the bracing rods are screwed. The struts in these girders are of duralumin or stainless steel depending on the stress conditions

"Ridge" and "radial" girders for the transverse frames are also triangular in section. The booms are of bulb section, with circular heads and two projecting flanged lips, between which are inserted and rivetted duralumin webs punched and flanged from strip metal. Booms for both types of girders are of the same section. Those for the "ridge" girders are of stainless steel, while those of the "radial" girders are of duralumin. The gauge of the section only varies. All webs are of the same type, pressed and formed in the same dies. Webs of the steel-boomed girders are composed of two thicknesses of duralumin, those of the duralumin-boomed girders of only one thickness, both formed on the same dies.

The ends of the booms of all types of girders are provided with machined fork or eye-end fittings with accurately reamed bolt holes for assembly in place. These terminal fittings are of standardized pattern for each class of girder and are finished to size before fixing in

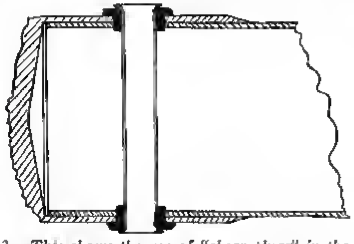
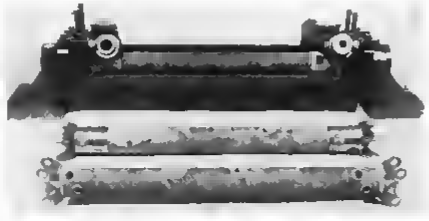


Fig 3. This shows the use of "shear plugs" in the new British airship for fixing terminals to thin-walled tubes. Light tubular rivets are used.

the booms. The method adopted for securing accurate positioning of these terminals is interesting and simple.

As an example of the methods for securing accuracy in these components the general process of assembling a main longitudinal may be described. The three boom tubes are cut-off in a "toothless saw" (a steel disc running at high speed) to the length specified on drawing for these members. Owing to the curvature of these girders this length is not the same for all tubes in the same girder. The cut length is subject to a reasonable tolerance. The tubes are marked off and drilled for the bolts securing the strut sockets, these are threaded on, bolts inserted, struts put into place, and the bracing wires screwed into their shackles. The terminal fork-ends are slipped into the boom ends, and the whole girder is placed in the erecting jig. This consists of two triangular cast-iron plates, provided with sockets at standard pitch to take the fork ends in the booms, secured to the jig sockets by accurately sized dowel pins through the bolt holes. These two end-plates are mounted on a channel-



A jig for drilling the base struts of longitudinal girders for "shear plugs."

iron base, planed flat on the upper surface, are movable along the base, and hinged so that they may be tilted relatively thereto over the necessary range of angles of intersection between girders and frames.

Distances between standard points on the end plates are set by the use of gauge rods with micrometer ends, and the correct angle is checked by offset measurements from a plumb-line. When the jig has been set for the girders of any given frame section the base is drilled and reamed for dowel pins which lock the end plates accurately in position, and permit of accurate resetting to the same position at any time. It will be seen that this jig, once set, forms an accurate model of the position of the girder-end joints in the complete ship.

When the girder is set up in the jig, it is trued-up, by means of bracing wires, to the desired curvature, which is measured at specified points along the planed bed of the jig. When the correct camber is secured the fork-end terminals and the booms are drilled through and reamed in the jig, and the "sheer plugs" which hold them in place are inserted. This method ensures accuracy of position of the end-fittings to a remarkable degree.

The permitted tolerence on the lengths of the 45 ft. longitudinals is ± .030" from the nominal dimension with a limit of .020" as the maximum difference between any of the fifteen longitudinals which are to fit between the same frames. No difficulty has been found in keeping within these limits which have pretty certainly never before been maintained on any structure of comparable dimensions.

The "shear plugs" (Fig. 3) referred to above are a device for transmitting the very heavy loads on girder terminals to the very thin walled boom tubes. To keep the bearing stress down to permissible limits large diameter and consequently heavy pins or bolts would be required. The shear plugs are short hollow flanged pieces of H.T. steel, just long enough to pass through fork-end and tube wall. A large diameter hole is drilled and reamed through the two components, one of these "plugs" is inserted in each end of the hole, a length of thin gauge steel tube is passed through both plugs, and has its ends spun down on the plug flanges, thus holding them firmly in place.

"Ridge" and "radial" girders are made accurately to length by a similar process of drilling, reaming and

pinning terminals into the booms between "end-jigs." As these girders are all assembled by rivetting the booms to the duralumin webs, special assembly jigs are used to hold them straight during drilling and rivetting. These jigs consists merely of two end plates with plugs to fit into the booms, and a series of ring-steadies arranged along the base which hold the booms in place during the process.

"Ridge" and "radial" girders are all straight and square ended, the varying angularity of joints between the straight sides of each frame and the longitudinals being provided for by special joint members. Of these the most important are those between the outer "ridge" girders of the transverse frames and the longitudinals. These joints are standard duralumin die-stampings consisting essentially of a three armed "spider," ending in lugs which are faced and drilled to take the fork-end terminals of the triangular girders themselves, carrying angular bosses which enter between forks carried on special end-struts on the longitudinal girders. The three lugs for the ridge girder joints are at standard centers, but obtaining the correct angular relation between the angular bosses and the base fixed by these three points involves rotation of the stamping about two mutually perpendicular axes.

The standard stamping has to provide for machining these lugs to any of the required angular settings, and consequently a good deal of metal has to be removed from each. In order to avoid distortion after the removal of large quantities of material the stamping is supported in all machining operations from three "spot faces" under the three lugs, thus imposing minimum constraint on the stamping by jigs. Actually no trouble on the score of distortion has been met.

The jigs used for milling and boring the stamping consist of a cradle, supporting the stamping from the "three spots," which is in turn supported from a base plate on one vertical and one horizontal trunnion, so that the stamping may be rotated about the two axes to the necessary attitude.

Graduated arcs are provided for setting. These arcs are marked with part numbers corresponding to those of the finished joint, so that the operator has only to set

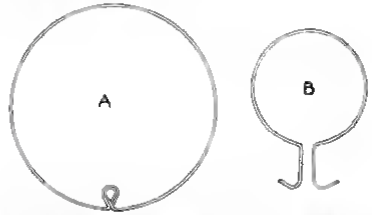
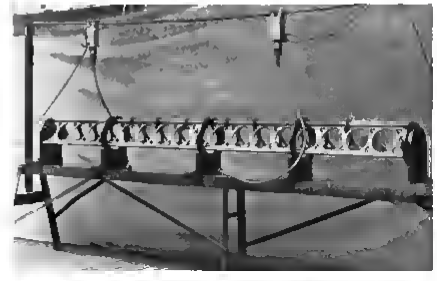


Fig. 4-A. Sectional drawing of the closed joint tube, drawn from a flat strip. 4-B shows a bulb section, rolled from strip. These are two of the four types used in the R.101.

the two arcs to the required part number and insert dowel pins to lock the jig to ensure correct setting. He stamps on each part machined the number shown by the jig setting, and all the inspection necessary is to check the correspondence of the number on the joint with those set on the jigs, and to see that the part will fit the jig thus set.

It should here be mentioned that no bolt holes have been left to be drilled in place on the erection of the ship. All have been drilled and reamed at Norwich, and the bolts have all gone into place without fitting on final assembly, which is sufficient testimonial to the accuracy both of design and workmanship on the part of the constructors.

The methods used for producing the sections used in the main structural members of this ship are of extreme interest. They result from a long period of research and



A jig for drilling and riveting the "ridge" and "radial" girders of the new British airship

experimental work, attended by many difficulties, but they are now so developed as to be rapid and economical as a practical manufacturing process.

It should be pointed out that, neglecting machined parts for joints, the whole of the hull-framing of the R.101 is built up from only four types of section. One of these is a solid drawn circular tube of nickel chrome steel, hardened and tempered. This is used only in relatively short lengths and in small quantities. Of the rest there is the closed joint tube (Fig. 4-A) drawn from flat strip in either stainless steel or duralumin, the bulb section (Fig. 4-B) rolled from strip in the same two materials and the girder web, pressed from strip duralumin.

The stainless steel used is of the following composition—Carbon, 0.16 per cent. to 0.22 per cent., Silicon, not more than 0.5 per cent., Nickel, not more than 1 per cent, Chromium, 12.5 per cent. to 14 per cent. It is supplied by the steel makers in coils of strip about 70 ft. in length, rolled to the final gauge thickness, and in a fully annealed condition.

Forming of the closed joint tube involves cutting to correct width in a special strip cutter and then a series of passes through dies on a drawbench. The first operation is the turning up of the two edges which will form the joint. The next passes successively bend the strip to the required tubular form, the turned up edges forming inwardly projecting fins. The last forming operation consists in drawing through a circular die and over a mandrel. This mandrel has in it a tampered formed groove, which forces the inwardly projecting fins over and turns them up on themselves.

The drawbenches used were designed and made by Boulton & Paul for this type of light metal construction. They will form tubes, or other sections in lengths of up to 70 ft. The drawing head is driven from a continuous chain, in turn driven through an infinitely variable friction dise gear, by an electric motor. Speed control is effected from the die-head where a speed indicator is also fitted.

Working with stainless steel the drawing speed is limited to about 3 ft. per min as this material is apt to "pick up" on the dies, and serious limitations are imposed on the type of lubricant which can be used, as one which caused carbon deposit in the subsequent heat treatment might lead to carburization and consequent

(*Continued on page 2122*)

Controlling *the* Overhead Expenses

By Edwin R Douglas

IN the first article of this series, we considered the things to which the airplane manufacturers must give attention during the transition from experiment and development to intensive low-cost production. We saw that these were grouped under three heads of production and its control, marketing and administration, including cost, accounting, and financing.

We saw that modern management controls these things through the application of exact, centralized knowledge of what is to be done, how it is to be done, where it is to be done, and when it is to be done, that cost reduction is to be attained, not by post mortem cost figuring, but first, by advance planning and production control, and, second, by unremitting attention to those items which constitute overhead expense.

In seven succeeding articles, we discussed the methods for the planning and control of production, viz: specifications, control-boards and charts, labor and material tickets purchase orders, etc. It was pointed out that the extent to which these can be applied depends on the degree to which the product has been standardized. As standardization progresses, the detail of production control should progress with it. Even where the product is still subject to variations, the elementary operations may be fairly well standardized and controlled. Airplane and engine manufacture has now reached that stage where (though still subject to many changes) parts and assemblies may be made in lots of twenties, hundreds, and sometimes thousands, with assurance that they will be used up. Production specifications for such parts may be written, and the methods of production control started, even though it be not feasible to extend them to every part, or to the final assembly.

Controlled Production

The control of production means the control of and reduction of costs. While many improvements in methods and reductions in costs can be made as the result of observation without controlled production, the latter steps in when the former seems to have reached its limit, and produces results that are sometimes amazing. The superintendent, or foreman, who has not experienced this, cannot realize it and is frequently adverse to adopting these methods, calling them "red tape." It is the mission of these articles to point out that, properly applied, they are not red tape, but the means—and the only means—to that final efficiency in production and economy in operation which will insure the progress and endurance of an airplane, or engine business. The manufacturer who does these things well, will stand his fair chance to be among the headliners 20 yr. from now. Those, who do them less well, stand no chance at all. They will drop out.

However, while production control will be one essential to success, and a great one, it is not the only one. The others lie in the application of exact, centralized knowledge in the other fields of operation—in marketing and administration, and in their sub-activities. We shall now consider one of these sub-activities under administration—the subject of costs, and in particular that of overhead and its control.

Estimating Costs

An article is placed before us and we are asked to make an estimate of the cost of manufacturing it and of the profit it should produce. By what course shall we proceed? Normally, we shall first set down a list of the materials that compose it, their quantities, prices, and values. Then, considering in turn each elementary part, we shall judge how it would be made, by what operations, on what machines, how long each would take, and at what cost of wages. All of these we shall likewise set down. So adding up, we shall arrive at an estimate of the total costs of material and labor. Let us do this, in mind, not for one piece alone, but for the whole output of a plant over a period of time, say a year, and add them all up. Again we have an estimate, now covering a large amount of material and the labor of many men. This has covered the plant's entire output for the year, but will it equal the entire purchases and payroll for that year? Indeed not.

Our estimate covered all the direct items, all the material that entered visibly into the product and the labor of all the men who worked directly on it but it omitted all others, and the others are many. They are the indirect, the so-called non-productive labor and supplies. These include all clerks, foremen, superintendents, purchasers, salesmen, and executives; all repair-men, engineers, firemen, watchmen, storekeepers, receivers, shippers, and common laborers; fuel, oil, waste, stationery, and miscellaneous supplies; insurance, taxes, special services, books, magazines, memberships, donations, advertising, and exhibits; machinery, tools, furniture, fixtures, power equipment, buildings, and the maintenance of them;—the list seems endless of the things not covered by our estimate.

All these things are in the books of accounts and will be covered by a profit and loss statement for the year: and there are still other things, not labor or supplies, covered by that "P. & L." statement—depreciation, interest, discounts, reserves for bad debts, reserves for income tax, and others—before the final figure for "Net Profit" appears.

The purpose of our estimate was to determine whether

(*Continued on page* 2118)

About Glue *and* Gluing Practice

By C L. Ofenstein
Aeronautical Engineer, Department of Commerce

AS a result of an inspection trip of six weeks among commercial aircraft factories, it is believed that a few notes on glue and gluing practice are opportune at this time.

There are a number of kinds of glues. Of these, casein, blood albumin and animal glues are the most important in aircraft construction. Marine glue is used in the construction of wooden hulls and floats. Animal glue is used chiefly in the manufacture of propellers, although some of the largest manufacturers are now using casein glue for this work. Blood albumin glue is used in the manufacture of plywood, and is used hot. Casein glue is used in the fabrication and assembly of other wooden parts of the airplane.

Animal glues are made from the hides, bones, sinews and other parts of the animal. The best grades of animal glue are made from hides and are called, therefore, hide glues. This glue comes in the form of flakes, and must be soaked in water and heated before being used.

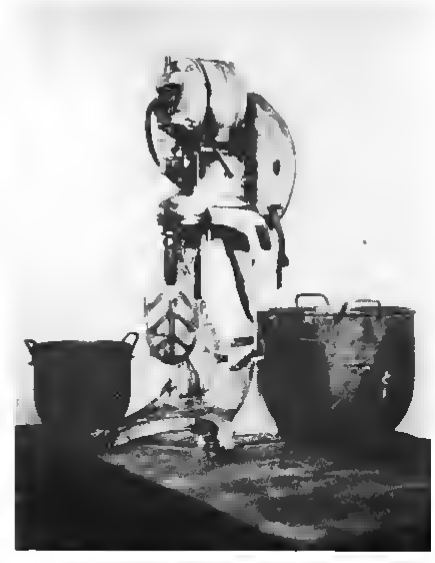
Casein glue is made from casein, obtained from sour milk, combined with lime and other chemicals, usually by manufacturers' patented formulas. A great difference exists in the water resistance of various casein glues. Only the more water resistant glues should be used in aircraft construction.

Heat and Pressure Necessary

Blood albumin glues are made with an albuminous base obtained from the blood of slaughtered animals, combined with chemicals such as lime, caustic soda, sodium silicate, etc. It requires heat and pressure to set and coagulate the blood, and as a result, its use in airplane construction is limited to the making of plywood. Such plywood has always been considered the best, but recently plywood has been made with some of the newer forms of casein glues and has been found to be of superior quality. Casein glue is employed most extensively by the aircraft manufacturer and therefore the remaining notes will be principally on its use.

Only a very few of the manufacturers visited conducted tests of the glues purchased. Most of them ordered "casein glue," and hoped it would give satisfactory results. It is believed that all manufacturers should conduct strength and water resistance tests not only to check up on the glue purchased, but also on their own mixers. The compositions of casein glue vary widely, so that no proportions of glue and water can be given. However, each manufacturer of glue furnishes its formula for mixing. It is strongly urged that these formulas be followed exactly. The proper amounts of glue and water should be obtained by actual weighing.

After the glue has been mixed according to directions, tests should be made before it is used. Tests for adhesiveness should be made on at least four specimens, preferably of sugar maple. Each specimen should consist of two pieces ¾ in. thick, 2 in. wide and 1¾ in. long, glued together on their flat faces, so that the ends project ¼ in. beyond each other. These blocks should be held under pressure 15 hr., and allowed to stand six days before testing. The blocks should be so held in the testing machine that the joint is tested in shear. The average shearing strength of the glued joint should not be less than 2,400 lb. per sq. in., with a minimum for any single block of 2,000 lb. A wood failure will be secured, if the glue is of proper quality and mixture.



This illustration, which appeared in the N. A. C. A. Technical Note No. 291, shows the "dough" type mixer. This machine is well adapted for mixing casein glues and has been recommended where new mixers are installed.

(*Continued on page* 2112)

Problems *of* Aeronautical Training

By Roy Campbell, Jr

Vice President, San Diego Air Service Corp

AERONAUTICAL training is divided into two classifications First, engineering, which includes the advanced instruction in aerodynamics given by universities and colleges, and the more elementary engineering instruction and ground school training conducted by civilian schools. The formal educational institutions are best qualified to teach purely engineering subjects and commercial organizations are better equipped to give instruction in the operation and maintenance of aircraft.

The regulations governing aircraft and airmen promulgated by the United States Department of Commerce have been of untold assistance in the safe and sane development of commercial aviation At the same time they have created a problem in training students qualified to meet these requirements and have made imperative the creation of higher aeronautical training standards in commercial schools

Only a few years ago it was common practice to consider aviation training covering a period of hours flying with no ground instruction sufficient for the development of a commercial pilot. Today, the Department of Commerce Regulations and the matured judgment of leaders in the aviation industry both demand that a great many more hours and thorough ground instruction be covered before a student is competent to assume the responsibilities of commercial flying.

Requirements for Licenses

The Department of Commerce regulations provide that transport pilots must have 200 hr. of solo flying, limited commercial or industrial pilots 50 hr, and private pilots 10 hr. In addition to this, it is required that pilots of each class have a basic knowledge of the repair and maintenance of aircraft and engines, thorough familiarity with the air traffic rules and, for transport pilots, mastery of navigation and meterology. This theoretical knowledge can only be acquired with intensive shop experience, supplemented by adequate text books and lectures

Commercial aeronautical schools endeavoring to meet these requirements have been forced to increase greatly the number of hours of flight instruction and to establish a thorough ground school curriculum, thereby materially increasing the cost to the student of qualifying as a pilot The better schools have established three courses of instruction, each designed to qualify graduates for one of the Department of Commerce licenses Approximately 225 hr flying now is given for the transport license, 60 hr. for the limited commercial or industrial license and a 20 hr. course for private pilots, thus giving the average student the required number of solo flying hours. In some cases, the graduate will not have had sufficient solo hours

Using the "gas" truck, which is part of the equipment of San Diego Air Service, to fuel one of the Travel Air biplanes operated by the company.

to qualify for a license, thus necessitating the purchase of additional flying time.

In order to eliminate the possibility of rejection when applying for a pilot's license because of physical disability, most schools require the student to pass the physical examination for the license which he hopes to obtain upon graduation, before entering the school, i. e, a student with no previous flying experience, enrolling in a 60 hr course, is required to pass a limited commercial physical examination before commencing instruction. By establishing this requirement and eliminating at the outset those physically unsuited to flying, it has been found that 85 to 90 per cent. of the students enrolled can qualify for the license within the number of hours regularly included in the course.

In order to cover theoretical and shop instruction properly and give sufficient hours of solo flying, it is necessary to charge approximately $3,000 for instruction sufficient to qualify for a transport pilot's license*. It is evident that the great number of pilots needed in the aviation industry cannot be trained at a unit price of $3,000 One of the most vexing problems in aviation today is how to give sufficient training and still maintain a price schedule low enough to meet the financial ability of the young men who wish to enter the aeronautical field.

Those who can afford to take eight to 12 months' instruction in a thorough ground school and the 225 hr. training in the air are able to enter aviation on a profitable basis in the minimum possible time. Unfortunately, only a few can afford this method The practical solution for the average student is to take either a 20 or 60 hr. course to qualify for a private or limited commercial license

Contrary to the statements generally made, a graduate from either of these courses cannot usually find employment as a commercial pilot until he has had more experience. However, if the student, while taking this training, is given sufficient shop experience and class room instruction on the repair and maintenance of aircraft and engines, it is possible for him to secure a position as a mechanic's helper, receiving as compensation additional flying time, thus gaining the solo flying hours necessary for a transport license

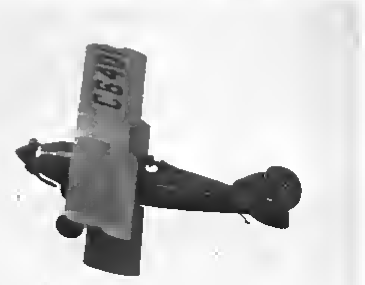
By this method it is possible to spend something less than $1,000 for primary instruction and then get additional flying experience in exchange for mechanical work By this method, it will probably take a minimum of one or two years before it is possible to qualify for a transport pilot's license. Although this may seem an arduous process, the price would not seem to be too high when the prevailing high salaries of transport pilots and the almost unlimited opportunity today for a young man entering the commercial aviation field are taken into consideration.

Because of this situation, the San Diego Air Service Corp has established a school of aviation which places equal stress upon flight training and ground school instruction. The ideal of this school is to teach its students to operate aircraft skilfully and safely, and also to maintain their planes and engines efficiently in service The Corporation has decided to specialize exclusively on this activity

Three courses of instruction are given, the transport pilot's course covering 225 hr in the air and eight months' ground school instruction, the commercial pilot's course of 60 hr in the air and four months' ground school, and the private pilot's course including 20 hr. of flying and two months' ground school. In each course, the flying and ground school instruction are considered as a unit and in no case is one given without the other It is believed that each phase of the curriculum is equally important in training a thoroughly competent pilot

This photograph shows Pilot Douglas Kelly giving instructions to a student, using the Gosport type helmet

Flying operations are conducted under the supervision of the chief pilot who has complete charge of the operation and maintenance of all planes owned by the company All flights are definitely scheduled to the minute and arranged so that they fit in with the ground school program. The chief mechanic has the responsibility of seeing that the plane assigned to a student is on the line, inspected, warmed up and ready to fly at least five minutes before the scheduled take-off. The student is expected to have put on his flying suit, helmet and goggles and be at the plane ready to leave five minutes before scheduled take-off time Each student is expected to fly either dual or solo 30 min each day with the exception of Saturday and Sunday The balance of the student's time on each of the five week days, seven and a half hours, is spent in either class room lectures, shop training or study.



One of the Travel Air biplanes of San Diego Air Service Corp making a "flipper" turn Pilot Kelly is at the controls

Up to the present time commercial aviation training has been given almost entirely by air service operators and aircraft manufacturers. In most cases, the operation of a school has been one of the minor activities of the business, although there have been a few notable exceptions. This tendency of considering aeronautical training of one of the minor activities of commercial aviation has mitigated toward inefficiency in training

Because of this situation, there has been listed in the various aeronautical trade directories a great number of commercial aviation schools The Aeronautics Trade Directory of the United States Department of Commerce, published May 15, 1928, lists 313 commercial aeronautical schools, exclusive of correspondence schools. Of course, by far the greatest percentage of these schools are conducted as a subsidiary of some other type of aviation business It is probable that not more than 10 per cent of the schools listed concentrate to any great degree on aeronautical training.

In a recent survey of the aviation industry, William P McCracken, Jr., assistant secretary of the commerce for aeronautics, stated: "In commercial training schools there has been almost incredible expansion Up to Aug 1, 1928 the Department of Commerce received 5 876 applications for student pilot permits. During the last three months, 2,928 medical examinations for student pilots were received There is nothing to indicate any decrease in this activity during the next year"

Comparing this statement with the tabulation of schools, it is seen that each school would be given an average enrollment of 18 students for the 12 months preceding Aug 1, 1928 It is probable that no more than 50 per cent of the students enrolled in commercial schools during 1927 obtained student pilot's permits from the Department of Commerce, which would indicate that the

(*Continued on page* 2112)

In the opinion of many prominent pilots, it is not possible to do this at a profit for less than $5 000.—The Editor

North American Aviation Buys Sperry Gyroscope

Widely Known Experimental Unit Becomes Sixth of the Recently Formed "Keys Group"

NEW YORK, N. Y.—Acquisition of the Sperry Gyroscope Co., one of the oldest and most widely known of all technical units in the industry, by North American Aviation, Inc., new $25,000,000 holding company of which C. M. Keys is president, has been announced by Mr. Keys.

The Sperry organization, long a leader in the effort to minimize the dangers of flying, thus becomes a member of the group which already includes Curtiss Aeroplane and Motor Co., Curtiss Flying Service, Transcontinental Air Transport, National Air Transport, and the Curtiss-Robertson Aircraft Corp. The gyroscope company was organized by Dr. Elmer A. Sperry in 1909. It has branch offices in all the principal countries of the world, and a subsidiary company, Sperry Gyroscope, Ltd., in England. It is associated with the Tokio Precision Instrument Co. of Japan. The factory and main offices are at Manhattan Bridge Plaza, Brooklyn. Charles S. Doran, associated with Doctor Sperry for many years, is president, and Tom Morgan is vice president.

Develops "Iron Pilot"

At first the company, organized to experiment with the gyroscopic principle, devoted most of its efforts to maritime instruments, but soon turned to the aviation field and since then has become more and more interested in the development of control devices for airplanes. Included among these are the "iron pilot," a control to give the plane an even keel. It is understood that a practical application of this instrument is to be made soon, and that it will afford guidance through fog and darkness, on an even and safe course. The most recent of these instruments is said to operate not only the ailerons and horizontal rudder but also the vertical rudder.

In recent years the company has been producing powerful searchlights and beacons for airports and airways.

Another aviation problem which Doctor Sperry has announced is nearing completion in his factory is that of the Diesel aviation engine, upon which European engineers have been working for years. He has said that practical tests would be made with an engine of this type within a year.

Mr. Sperry will remain with the company, and through the new arrangement will be able to devote more time to experimentation.

Completing Synthane Factory

OAKS, PA.—Organized in September under the laws of Delaware, the Synthane Corporation is completing the construction of its plant here and expects to commence production of bakelite products in spring. R. R. Titus is president, J. B. Rittenhouse is vice president, and George J. Lincoln is secretary and treasurer.

Curtiss Service Buys Michigan Dealership

DETROIT, MICH.—By a special arrangement with Curtiss Flying Service, Inc., of Garden City, L. I., Wings, Inc., of Detroit, heretofore Michigan distributors for Curtiss products, has sold its airplane sales division and flying school to the Garden City corporation. Wings, Inc., will continue to exist as an independent manufacturers' agent for materials and accessories, and will continue to be headed by Harry R. Graham, who has been president of the company since its formation several months ago.

C. V. Burnett, formerly secretary and treasurer of Wings, Inc., will become vice president and general manager of the Curtiss service in Detroit, with headquarters at the Aircraft Development Corp. airport on Grosse Ile. The training school here will include a school for instructors.

Honor Wrights

Orville Wright is shown beside the tablet marking the scene of his epochal flight.

Sikorsky Builds Bridgeport Plant

NEW YORK, N. Y.—The Sikorsky Manufacturing Corp., makers of the S-38 amphibions, will remove its plant from College Point, Queens, to Bridgeport, Conn., it is announced by W. A. Bary, vice-president.

A new $450,000 plant has been started at Curtiss Field at Bridgeport and will be completed in late spring or early summer. The field affords facilities for land planes, seaplanes and amphibians.

The Sikorsky corporation is now contemplating the construction of a huge 24 passenger flying boat. It is understood that work on this boat will be started upon completion of the new Bridgeport plant.

Air Corps to Refuel Duration Plane in Air

SAN DIEGO, CALIF.—New motors have been installed in the tri-engine Fokker monoplane, "Question Mark" which the Army Air Corps will start on an endurance test on the morning of January 1 that may last for more than two weeks, and will involve the feat of repeatedly refueling the plane from another plane while travelling at 80 m.p.h.

The flight, during which both oil and gasoline will be lowered from one airplane to another by means of a rubber tube, will be started from Los Angeles and if weather permits the plane will probably travel back and forth between Los Angeles and San Diego.

Successful re-fueling tests have already been made some 50 gallons of gas having been lowered from one of the two Douglas transport planes that will aid in the experiment in one minute, and 120 qt. of lubricating oil having been changed in 45 min. The three J-5 aircooled engines will require a daily total of about 900 gals. of gas.

The Question Mark has two gasoline tanks of 150 gal. capacity each, and the three daily refueling operations are expected to require about five minutes each.

Major Spatz and Captain Eaker will pilot the plane during the day, performing the refueling operations, and Lieutenants Quesada and Halverson will be the night pilots. Roy Hooe is mechanic.

Wichita Revises Air Statutes

WICHITA, KAN.—Wichita's city commission is revising the ordinance which regulates flying in Wichita. The new statute will cut the height for flying over the city from 2,000 to 1,000 feet and will permit landing and taking off in the city in order that aviators connected with the Cessna Aircraft Corporation will not have to violate the law every time they leave or arrive at Cessna field. The Cessna field is in the city limits.

Move to Improve School Situation

Aero Chamber Builds Organization to Secure Standard Of Requirements

NEW YORK, N. Y.—The Aeronautical Chamber of Commerce through its Flying School Committee which was appointed at the request of the Aeronautics Branch of the Department of Commerce, has made public minimum requirements for Flying Schools to be classified as recognized members of the Chamber.

The Temporary Committee consisted of C. S. Jones, New York; Oliver L. Parks, St. Louis, and Tex Rankin, Portland, Oregon. This Committee requested the Chamber to distribute a questionnaire among schools advertising themselves as giving either ground or flying instruction. Responses to this questionnaire confirmed the general conviction that the flying school situation required the constructive attention of the industry as a whole.

Mr. Jones, as Chairman of the Temporary Committee, called a Flying School Conference under the auspices of the Aeronautical Chamber of Commerce in the Stevens Hotel Chicago, Dec. 4, 1928. This Conference was attended by some 25 or 30 representatives of the flying school division of the industry from almost every section of the country.

A Committee of Nine

The Conference then recommended that the Executive Committee of the Chamber recognize the following permanent flying school committee to consist of 9 members, one each from the six geographical divisions of the Chamber, two at large and a Chairman. The personnel of this Committee as proposed to the Chamber is as follows:

Philip R. Love, St. Louis, Mo., Chairman; C. S. Jones, Garden City, N. Y., representing Eastern Division, centering on New York; Jack Stinson, Detroit, representing North Central Division, centering on Detroit; Oliver L. Parks, St. Louis, representing Great Lakes Division, centering on Chicago; Ted Braley, Wichita, representing North Western Division, centering on Seattle; W. B. Haviland, Minneapolis, representative at large; and D. P. Wardwell, Casper, Wyo., representative at large.

To Elect One Delegate Later

Selection of the representative from the South Western Division, centering on Los Angeles is to be determined by Chairman Love in conference with the Vice-President from the Los Angeles Division to be elected at the next annual meeting of the Chamber.

The Conference emphasized the fact that flying schools operating for the most part within the boundaries of a state did not fall within the control of the Federal Air Commerce Act. It was the sense of the Conference that the Chamber could assist the general situation, however, by setting up standard requirements. Schools would be required to measure up to these requirements before being recognized as members of the Aeronautical Chamber of Commerce.

Accept Seven Requirements

After thorough discussion the Conference unanimously accepted the following seven minimum recommendations for recognized schools:

1. The minimum flying course to receive recognition qualifies a student for a private license.

2. All flying instructors must be licensed transport pilots.

3. All airplanes used in school instruction shall be licensed by the Department of Commerce.

4. It was recommended that the permanent Committee be instructed to make definite recommendations as to the minimum size of the flying field on which it is safe to conduct a flying school, also to discuss the question of the operation of the school from a runway field where there is a large volume of transport business.

5. It was recommended that the permanent Committee make definite recommendations as to how to control the misleading advertising now used by many schools.

Must Give Ground Courses

6. A school to be recognized must give ground school courses in the subjects required by the Department of Commerce for a transport license.

7. A daily inspection of equipment must be enforced.

The following resolution was unanimously adopted for submittal to the Aeronautics Branch of the Department of Commerce, regarding the issuance of limited commercial pilot's licenses:

"It is recommended that a student be eligible for examination for industrial or limited pilot's license after having received a total of 50 hours instruction 25 hours of which was dual instruction and 25 hours solo instruction as an alternative for the present requirement of 50 solo hours."

Fairchild to Use Assembly Lines

FARMINGDALE, N. Y.—Quantity production methods such as those used in automobile manufacturing are to be used by the Fairchild Airplane Manufacturing Corp., according to an announcement which has just been made by the company.

Using three assembly plants, one for each model plane the concern expects to produce 1,200 planes during 1929 as compared with 175 planes in 1928. Howard C. Decker, formerly an engineer at the Ford plant, is production manager.

Form Pittsburgh Holding Concern

Five Subsidiary Firms Included in Program to Promote City's Interests

PITTSBURGH, PA.—Formation of a $6,250,000 syndicate "to establish Pittsburgh as an aviation center" was announced recently by George R. Hann, president of the proposed Pittsburgh Aviation Industries Corp. The holding corporation, with authorized stock of 250,000 shares, was organized "to control, manage, and develop in the Pittsburgh district the various phases of aviation."

Subsidiary to the holding corporation are the Pittsburgh Air Transport Corp., Pittsburgh Aviation Securities Corp., Pittsburgh Aviation Management Corp., Pittsburgh Aerial Survey Corp., and the Pittsburgh Aircraft Agency Corp.

According to the announcement the air transport corporation has been organized to operate in the field of general transportation, including transport of air mail and express operation of a ground school supplemented with flying instruction, as well as taxi service and sightseeing.

Aviation Investment Trust

The aviation management corporation will be devoted to the study and analysis of advantages of Pittsburgh for the manufacturer of aviation products looking to the bringing of factories to the Pittsburgh district. The securities corporation will function along the lines of an investment trust for aviation securities, but the investment will be confined to companies locating and manufacturing in this community.

The aerial survey corporation will devote itself to aerial photography and aerial survey while the aircraft agency corporation will take on agencies from various aeroplane manufacturing companies, engine companies and accessory manufacturers.

All the stock of the five subsidiary corporations will be purchased and held by the Aviation Industries Corp.

The officers are: president, George R. Hann, vice presidents, Norman Allderdice, Richard W. Robbins, and Thomas J. Hilliard; secretary, C. B. Mooro, treasurer, Charles L. McCune, and chairman of the executive committee, A. L. Humphrey. Col. Thurman H. Bane, former member of the Joint Army and Navy Technical Aircraft Board and former chief of the technical section of the Department of Military Aeronautics has been brought to Pittsburgh as technical advisor for the various companies.

Russell Names Arizona Agent

PHOENIX, ARIZ.—The Aero Corporation of Arizona was recently appointed Arizona distributor of Russell parachutes, and frequent demonstrations are given at Smith Central Airport here.

New Firm Gets Rankin Project

Aircraft Builders Corp. Assumes Plans for Production of Aircraft

PORTLAND, ORE.—Plans for early construction of an airplane plant near Portland, announced recently by Rankin System, Inc., have been taken over by a new company, the Aircraft Builders Corp., articles for which have been filed in Salem, Ore Capitalization of the new company is $250 000 It will be closely associated with Rankin System and J Kegerreis, president of the latter company, will serve as managing director of the new concern

George E. Love, Eugene, Ore., who for several years has been active in American Legion aeronautical activities, is president of Aircraft Builders. He was a director of the company first announced. A site for the factory has been chosen at Eugene and negotiations are under way for an airport to adjoin the factory

Year's Output Contracted

F. L. Chambers, vice president of the First National Bank of Eugene, is vice president of the new company. E. S. Goodwin Northwest representative for the Warner Gear Co., secretary-treasurer; Frank Jenkins publisher and editor of the Eugene Morning Register, a director Prof Alexander Klemin, dean of the Daniel Guggenheim school of aeronautics, consulting engineer and technical adviser, and Lieut. B B Smith, aeronautical engineer

Ground will be broken for the factory in January or February, Mr Love said The plant will employ about 100 men With the formation of the new company construction plans were elaborated. The two and three-place low-wing monoplanes are retained on the schedule, the three-place to be a coupe type Besides that a small biplane may be manufactured. Later construction of larger transport planes is contemplated

The whole first year's output has been contracted for, Mr Love said This has been arranged through contracts with schools which are branch agents for Rankin System, Inc The Rankin company syndicates the system of flying instruction perfected by J G "Tex" Rankin and his staff at the Rankin School of Flying in Portland Mr Kegerreis was formerly general manager for that company

Form Colfax Aviation Co.

COLFAX, WASH.—Incorporation of the Colfax Aviation Co to engage in the airplane and accessories business is reported here The capital is $10 000 and the incorporators include L L Bruning, Warren J Cram R F Bigelow and a number of other men of the district who are interested in the aeronautical industry

Dominion Gets New Amphibian

BUFFALO, N. Y.—A special twin-engined amphibian plane has been built here, according to reports, by the General Aircraft Corp. The craft, which was constructed for the Canadian Government, is powered by Whirlwind engines and carries eight passengers and two pilots.

Eagle Flying School Opened in California

SAN BERNARDINO, CALIF.—Formation of the Eagle Flying School which will offer instruction in the Rankin System of flying is announced here by R H Cash Bob Brook is flying for the school, and Jerry Merrit is in charge of ground instruction.

Mr Cash plans to open branch schools in Barstow and Beaumont, some time in January.

The Eagle Flying School is the San Bernardino representative of the Associated Aircraft, Inc., Hollywood, which is California state distributor for the American Eagle airplane.

Mr Cash has just received delivery of three American Eagle airplanes from the Associated Aircraft, Inc., which will be used for demonstration purposes and flying instruction at the Tri-City Airport, from which he is operating, and has placed an order for six additional American Eagles to be delivered after the first of the year

New Concern to Build Planes at Dodge City

DODGE CITY, KAN.—George Yonkers, capitalist of this city, is the central figure and organizer of an airplane factory for Dodge City The concern, to be known as the Yonkers Aircraft Corporation will build large transports with accommodations for at least 10 passengers, and small commercial and training ships for two and three passengers

Felix W A Knoll who recently came to Wichita from Germany to organize the Knoll Aircraft Corporation is said here to be the designer employed to outfit the new planes of the Yonkers concern He will remain in Wichita, however The transport plane which is said to have been designed by Knoll will be powered by three engines.

Shockley Establishes Branch

KOKOMO, IND.—Shockley Flying Service, operating Shockley Field three miles south of here, is establishing a branch in South Bend, Indiana Charles Bowers is acting manager and instructor there with an office at 323 S Main Street

Curtiss Indiana Officials Named

Capt. H. W. Cook Manages Unit Soon to Begin Instruction

INDIANAPOLIS, IND.—With completion of the organization of Curtiss Flying Service of Indiana, Inc., an announcement giving the personnel and the immediate plans of the company is made by Capt. H Weir Cook, general manager of this unit

On the Board of Directors are: G. M. Williams, president Marmon Motor Car Company, Indianapolis; Norman A. Perry, president Indianapolis Power & Light Company, Indianapolis; James Perry, president Indianapolis Baseball Club Casey Jones, president Curtiss Flying Service, New York; Capt. H Weir Cook, war pilot and recently flying instructor Indiana National Guard

Officers of the company are: President, James Perry; vice presidents, Mr Jones and Captain Cook, secretary, Paul Richey, who is president of Russell M Seeds Company, Indianapolis, treasurer, J A B Smith of New York

Plan Branch Offices

On the technical board are: Capt Cook chairman, Capt Charles E. Cox, jr., O. R C, assistant manager and in charge of flying operations; Capt Oliver H Stout of Indiana National Guard; Lieut. Fred J Marbucher, of Indiana National Guard, maintenance engineer; Lieut. Sidney A. Stout O R C, and Walker W. Winslow

Offices of the Curtiss-Indiana unit are at 646 Illinois Building; flying operations will be conducted from several fields now being selected Three Curtiss-Robins have been brought over from St. Louis and a Fledgling will be here within a couple of weeks Actual instruction will begin soon after the first of the year Plans are also under negotiation for branches in several Indiana cities where Curtiss products will be distributed and serviced, and flying instruction probably given.

It is stated that Curtiss Flying Service of Indiana will be the business representative of the T A T

Cirrus Sends Supervisor

NEW YORK, N Y.—W E. Packman, chief inspector, authorized by the British Air Ministry, of the Cirrus Aero Engines Ltd., arrived in New York this week to supervise the production and testing of the American Cirrus Mark IIf engines to be made at Belleville, N. J. Mr. Packman has had 14 years of experience in almost every branch of the aviation industry. He served as a designer for the British Government during the war and was later attached to the technical department of the Air Ministry The factory will be in charge of A. G. Lloyd, production manager.

City Lights Turned on By Siren From Plane

ST. LOUIS, MO.—The city's new lighting system was turned on from the air here recently when a plane owned by the Robertson Aircraft Corp., performed the unique feat of turning on the $2,000,000 "White Way" for downtown St. Louis while flying more than 1-000 ft. overhead Approximately 75,000 people gathered in front of the new Civil Courts Building to view the spectacle.

The lights were turned on by the scream of a high-pitched siren connected to the plane. The 1,504 lofty, twin and single-

Showing the siren which threw the switch to light St Louis' "White Way."

bulbed light standards were illuminated by an intricate electrical apparatus, which picked the sound of the airplane siren from the traffic roar and converted it into sufficient energy to throw in the switches controlling the system. The power surged gradually into the lamps until they reached their full brilliance.

The plane was piloted by Harlan E "Bud" Gurney, operations manager for Robertson, and E. Sloniger, pilot on the passenger service between St. Louis and Chicago

International Aircraft To Resume Operation

CINCINNATI, O.—International Aircraft Corp. is being reorganized, and will resume operation soon at its Ancor, Ohio, factory, near the Queen City, on a larger scale than before, according to word received by creditors of the organization, December 21

A contract has been drawn whereby the entire assets of the company have been sold to a group of New York capitalists headed by C. B. Morgenthaler. Although the agreement is subject to the approval of the International Aircraft stockholders, it is pointed out that persons in favor of the reorganization control enough stock to ratify the sale

The Ohio corporation has been furnished sufficient funds by the new owners to again start manufacturing airplanes promptly at the Ancor plant, it is said

Robertson to Use New J-6 Wrights

ST. LOUIS, MO.—Announcement is made by the Robertson Aircraft Corp., operating the St Louis-Chicago air mail service, that the Travel Air planes used on the route are to be equipped with the new J-6 300 hp Wright engines, replacing the present 200 hp. Wright. This, it is said, will gives the planes a cruising speed of 110 m.p.h as contrasted to 95 m.p.h as at present. A top speed of 145 m.p.h., furthermore, is promised, as well as shorter flying time, and greater carrying capacity.

Air Race to St. Louis Approved by N. A. A.

WASHINGTON, D. C.—A cross country race to St Louis, May 28-29 30, for prizes totaling $10 000 furnished by Robert E Gardner of that city, has been sanctioned by the contest committee of the National Aeronautical Association in a meeting here at which Orville Wright, chairman, presided.

A series of elimination meets will be started from the cities of Buffalo, Jacksonville San Antonio, Denver, and Bismark N D., and end at Parks Field, East St Louis, Ill. The first half of the cash prizes, or $5,000, will be awarded for these events

The main event will be a race from Parks Field to the Indianapolis Speedway and return, for which the remaining $5,000 and the Gardner Cup will be awarded.

Claim Solo Endurance Record Set by Woman

NEW YORK, N. Y.—What is claimed to be a new unofficial endurance flight mark for a woman was made at Roosevelt Field, Long Island, on Decembee 20 when Miss Viola Gentry, piloting a Siemens Halske powered Travel Air remained aloft eight hours, six minutes and thirty-seven seconds.

Miss Gentry hoped to stay up 15 hr, but encountered thick weather and when ice began forming on the plane's wings was forced to give up the attempt She carried a sealed barograph, which was certified by an N A A official, and later filed at Washington

The aviatrix has announced that she will make another attempt to set a 15 hr. solo record early in January

Name New Orleans Secretary

NEW ORLEANS, LA.—The New Orleans Airport Commission has chosen as its first executive secretary Marshall Callander, prominent local newspaperman and a veteran of the army air corps during the World War

To Erect Plant At Lunken Field

Aeronautical Corporation Plans To Make Lowest Priced Semi-cabin Plane

CINCINNATI, O.—Plans have been completed by the Aeronautical Corporation of America to begin construction, in the spring, of a factory building 300 by 100 feet at Lunken Airport, Cincinnati, where the organization will build what it claims will be the lowest priced plane of its type in the United States—a semi-cabin model at $2,500 less motor, capable of 125 m.p.h top speed and 100 m.p.h cruising speed.

Officers of the corporation, just elected, are: D. C. Killer, president of the Dow Drug Company, large drug chain, president, Taylor Stanley, secretary of the American Laundry Machinery Company, Norwood (Cincinnati), vice president, Robert A Taft, Cincinnati attorney, secretary, J. J. Castellini, president of the Brotherhood National Bank, Cincinnati treasurer, and Conrad G Dietz, Cincinnati, general manager

Directors are Walter A. Draper, president of the Cincinnati Street Railway Company, and Messrs Keller, Castellini, Taft, Stanley and Dietz, with three others to be elected

LeBlonds Will Be Used

Negotiations have been opened with the City of Cincinnati for lease of six acres at Lunken Airport, for the factory site The company also expects to have a flying school in connection with the factory Eventually it plans to make its own motors, although LeBlond motors made in Cincinnati, probably will be used in its first models

Capitalization of the corporation consists of 3 000 shares of Class A and 5 000 shares of Class B stock, the public being invited to participate in the project Two shares of preferred and one share of common are being sold in units for $200. Stockholders include John Omwake, J M. Richardson, E B Stanley, Bolton S Armstrong, Henry C Yeiser, Jr., John Gilligan—all prominent Cincinnati business men—together with the officers and directors above named

Try New Slotted Wing on Pinto

MINNEAPOLIS, MINN.—Tests on a new type of slotted wing, first revealed at the International Conference on Civil Aeronautics, will be conducted on a Pinto plane of the Mohawk Aircraft Corp here in the near future, John B Akerman, chief engineer, announced A plane is now being equipped with the slotted wing and flight tests are expected to start early in the spring If successful, the wing will be incorporated into a commercial plane

Trade Tips

It has been Reported That—

—Julius F. Reither, 523 H. H. Bldg., Cape Girardeau, Mo., is about to establish a $25,000 airport on King's Highway and plans to erect a one-story and basement hangar.

—The Grant County Flying Club, recently organized at Marion, Ind., with a membership of 15, is planning to purchase a plane. Theodore Wilson is acting president.

—Kokomo, Ind., is considering financing installation of lighting equipment at the local airport, which is operated by the Shockley Flying Service.

—The Harvard Flying Club is raising a fund to build a hangar at the Boston Airport, but it is not expected to be in the market for construction before the Fall of 1929.

—The city of Corpus Christi, Tex., is considering bids for construction of a hangar at the city airport, and contract will probably be let soon.

—J. C. Mahan & Bros., 814 Market St., Knoxville, Tenn., is interested in establishment of a commercial aviation company.

Robertson Air School Into Universal Chain

ST. LOUIS, MO.—The Robertson School of Aviation, where Col. Charles A. Lindbergh taught many embryo aviators, has merged with the Universal Flying Schools, it was announced by Frank Robertson, president of the Robertson Aviation Corporation. The Robertson school now is affiliated with the Mid-Plane Flying School of Minneapolis, and the Egyptian Airways Flying School of Marion, Ill. The Robertson School is the largest and oldest of the group, having been in existence for ten years, and the total enrollment of the merged group is approximately 500 pupils.

W. B. Haviland, a former commander in the Navy during the world war, and also one of the original organizers of the Lafayette Escadrille, is director of the Universal Flying Schools. William Dings, who has been connected with the Robertson Flying School, has been appointed Manager of the Robertson school. Alvin D. Niemeyer has been made Chief Flying Instructor for the latter school. Niemeyer formerly was Vice-President of the Texas Air King Company, and also instructed in the Houston Aeronautical Service.

Schools will be started at Cleveland and Chicago the early part of January, according to Haviland, beginning a large expansion program to include a chain of flying schools throughout the country. The curriculum also will be greatly enlarged.

Army to Build at Louisville

LOUISVILLE, KY.—The Louisville and Jefferson County Air Board at its last meeting approved Army plans for the erection of new hangars and offices in the Army area in the southwestern section of Bowman Field, the municipal air port in Seneca Park. The approved plans were endorsed by Lieut. James A. Ellison, military commander of the field and were recommended by the Field Committee of the Air Board, composed of Albert Woody and L. S. Vance. Arrangements are being made for extensive improvements on the field's surface.

Companies Announce Changes in Personnel

NEW YORK, N. Y.—A number of changes in personnel have been announced in various phases and companies of the industry during the past week. Among them:

RUSSELL J. MCNOWN, who recently resigned his position as chief pilot of the Tri-City Airways, Inc., of Beloit, Wisconsin, has accepted a position as Michigan representative for the Hamilton Metalplane Co. of Milwaukee, Wis.

ROBERT GAST, general manager of the Cardinal Fliers, Inc., of Bowman Field, Louisville, Ky., has resigned to become personal pilot for John Hertz, Chicago sportsman.

BURT ISON, formerly Chief Flight Instructor for the Robertson School of Aviation, has been appointed Operations Manager for the Chicago terminal of the Universal Air Lines System. He has been flying for 13 years, has more than 7,000 hours to his credit, and has flown more than 25 different types of planes.

DANA BOLLER and TED PETERS have been employed recently as student instructors by the Harry Sperl Aircraft Corp., according to an announcement by Harry Sperl. H. L. RICHARDSON is field manager.

AMOS PAYNE, head of the Parks Aircraft, Inc., engineering staff, is chief engineer and production manager following the resignation of RICHARD F. HARBIN. W. M. THOMPSON, for nine years civilian employe of the Army Air Corps, has been named head of the mechanics' school of Parks Air College, and HOMER CLARK, formerly with the Travel Air factory force has been appointed assistant production manager.

Jackson Turns 417 Rolls

ST. LOUIS, MO.—Dale "Red" Jackson test pilot for the Curtiss-Robertson Manufacturing Co., is reported to have completed 417 consecutive barrel rolls in a Curtiss Robin plane, at Lambert-St. Louis Field, December 18. The previous record was 283 consecutive rolls.

Boeing Building Mail Plane Fleet

Ten of "95s" Capable of 1600 Lb. Cargo to Be Released Immediately

SEATTLE, WASH.—Based on satisfactory test flights recently completed, a fleet of 25 planes designed to handle mail and express only is under construction at the Boeing Airplane Company's Seattle plant, it is announced by P. G. Johnson, president.

The new planes are based on the experience gained through the operation of some 3,000 000 miles of service by Boeing Air Transport and Pacific Air Transport. Ten of them are to be released immediately for service on the San Francisco, Oakland-Chicago route to augment the present fleet.

The new biplane, known as '95," took off with a full load in 10 sec. and with run of 525 ft., and climbed to 7,750 feet altitude in 10 min. It made a top speed of 140 miles per hour, and landed at 53 miles per hour. The plane is powered with a Pratt & Whitney "Hornet" engine developing 525 hp.

Employs Steel and Dural

Four mail and express compartments, totaling 89 cubic feet, have a cargo capacity of 1,600 pounds. Fully loaded, the ship weighs 5,840 pounds. The span of the top wing is 44 feet 3 inches. The body is of steel and dural construction with dural covering back to the pilot's cockpit and fabric covering from that point to the tail section. The wings are fabric covered of wooden box spars and wood rib construction. Among the special features of this plane are electric inertia starter, Boeing type elco landing gear and tail skid, Bendix wheel brakes, internally mounted parachute flares with Boeing release mechanism, retractable landing light controllable by the pilot, cockpit heating system, adjustable pilot's seat, and control surfaces of all metal construction. The planes will be finished according to the color scheme which universally identifies Boeing equipment, Boeing green body, aluminum colored wings with the exception of the upper surfaces of the upper wing which is chrome yellow, and with aluminum colored tailed surfaces edged with Boeing Green.

Colonial Flys Mail Special

NEW YORK, N. Y.—Special permission to Colonial Air Transport, Inc., allowing operation of mail planes between New York and Boston on Sunday, December 23, was granted by Postmaster General New. This measure was necessitated by heavy Christmas mails. An increase from the usual daily average of 150 lb. of mail to 430 and 600 lb. was noted.

AIRPORTS AND AIRLINES

Hasten Litigation On Bond Validity

Airport Issues in Six Oregon Cities Are Delayed by Roseburg Suit

ROSEBURG, ORE.—In order to speed action on the appeal of the plaintiff in the suit of L. E. McClintock versus the City of Roseburg to determine the validity of airport bonds, the attorneys have stipulated that the case shall be submitted without argument and the briefs will be filed with the Oregon Supreme Court at once. The fact that the case equally involves airport development in six Oregon cities where bonds have been issued, makes an early decision very desirable.

As the only questions involved are those of technical interpretation of the Oregon laws pertaining to authority granted municipalities in the issuance of bonds for airport purposes and the acquisition of land, the attorneys did not feel that arguments were necessary and will submit the case upon briefs alone.

Denies Power to Condemn

Two chief issues are raised, one being the question of whether or not an airport comes under the classification of a "public purpose" for which municipal funds may be spent, and the other raising the question of the procedure under which a city must act in securing land.

The Oregon law provides that cities may condemn land for airport purposes but gives no authority to purchase. It is claimed by the plaintiff that a city can exercise no right not expressely conveyed by the legislature contending that the city can secure the land only by condemnation. The Circuit Court in the first hearing of the case, where a decision was handed down in favor of the city, leading to the present appeal, held that the act of condemnation of land automatically carries the right of purchase as a first step.

Los Angeles Firm Opens Field

LOS ANGELES, CALIF.—Aeronautical Distributors, California and Arizona representatives for Spartan Aircraft, have recently opened an airport at 2801 Clyde St., Los Angeles, approximately one mile west of Rogers Airport on Mesa Drive. The field measures 2000 by 800 ft. with the long runway east and west in the direction of the prevailing wind. The runway is fairly smooth and is well drained. A hangar 68 x 70 ft. is located on the northern boundary of the field, with showers and club room inside. Two Walter powered Spartan biplanes are being operated from the newly opened field.

Gets Mines Hangars Contract

LOS ANGELES, CALIF.—The Union Iron Works of Los Angeles submitted the lowest bid recently for construction of two steel hangars at Mines Field, the new municipal airport. Each hangar is to measure 100 by 100 ft. and a connecting building 30 by 100 ft. will be used for shop purposes. Union Iron Works offered to furnish the steel complete for $21,000.

To Begin Construction On Three New Routes

WASHINGTON, D. C.—Construction work is expected to be begun on three more airways this month, according to the Department of Commerce. Contracts have been awarded for the Indianapolis-Chicago, the Kansas City-St. Louis, and the St. Joseph-Omaha airways, field officials of the Aeronautics Branch of the Department report.

Two other airways are expected to be completed by next month, the field officials also report; the New Orleans-Atlanta airway should be completed by the first of the year, and the South Bend-Kalamazoo airway is expected to be lighted about the middle of the month.

The Louisville-Cleveland airway is reported complete, with all beacons and field lights in operation.

Coast Firm Has New Field

LOS ANGELES, CALIF.—All of the flying activities of the Aero Corporation of California have now been transferred to the newly acquired Master Aircraft Field which adjoins the old Aero Corporation site. The two locations are connected by an excellent runway and a complete aircraft and engine overhaul shop is being maintained at the old field, planes requiring service or repairs merely taxiing over to the shops from the main field.

Several new hangars have been completed on the new field and the executive offices of the Aero Corporation have been moved to the new location on the Master Aircraft Field.

Dedicate Dubois, Ida. Field

DUBOIS [illegible] nty seat o[illegible]Cla[illegible] Pocatello and [illegible] Great Falls airw[illegible]cently dedic[illegible] airport, Laird Field.

Urge $10,000 for Ogden Field

OGDEN, UTAH.—The city commission has been urged to place an item of $10 000 for Ogden airport in the 1929 city budget. This would be used to have the air field properly graded and lighted.

Boston Contracts 1929 Construction

Definite Progress Noted as Firms Lease Hangar Sites at Airport

BOSTON, MASS.—Rapid progress on the 1929 plans for Boston Airport under administration of the Park Department has been made in December. Leases have been given by the city to commercial operators for their hangars and construction must start before March or within 60 days of the signing of the leases. The city has completed an ornamental vehicle driveway with a circle at the airport tip, extending from Maverick Street, East Boston. The contracts have been awarded to Coleman Brothers for new runway surfaces behind the Army, National Guard, and commercial hangars of the present airport. Sewer, water, and electric power pipes and conduits have been contracted for at the sides of the field along the newly designated hangar area. A temporary hot water plant is being built to serve the fliers this winter.

Many Prospective Users

After a series of conferences with officials of the several flying companies, the terms of the leases for hangars were agreed upon. The city has decided upon a standard plot for large hangars to be 105 ft. along the flying field end and 220 ft. on the sides. Between hangar plots there will be 100 ft. clear for passage of planes. The ground rent for these plots is to be $1,000 per year. After 10 yr. a new rental will be fixed, in no case more than $1 500 per year.

The companies which apparently intend to build hangars immediately and their chief representatives are: Boston Airport Corp., President Raymond P. Baldwin, 1 Federal Street, Boston; Skyways, Inc., Crocker Snow, Copley-Plaza Hotel, Boston; Bay State Flying Service, President Fred Pereira, Boston Airport; Colonial Air Transport, Inc., Traffic Manager B. Anthony Pollet, Chamber of Commerce Building, Boston. The Harvard Flying Club, Inc., is raising a fund to build a hangar but is not expected to be [illegible] ket for construction before the [illegible] 9.

Single Plane Hangars

[illegible]o these large hangars which [illegible] general uniformity, built [illegible]ston building laws after [illegible] case approved by the [illegible] Park [illegible]ter, there is a tract set aside for sing[illegible]lane hangars, to be built in units of from three to 10 plane capacity. Ground rentals will be in proportion to those for the larger tracts of land at the airport.

New Metropolitan Field is Dedicated

Ceremonies at Los Angeles Draw 15,000 Persons and Many Planes

LOS ANGELES, CALIF.—A crowd of about 15,000 people turned out to witness the dedication of Los Angeles Metropolitan Airport on Dec. 16th. More than 75 airplanes flew to the field for the contests and ceremonies and 200 aerial guests were served a barbecue banquet within the main hangar. In addition to such standard planes as Ford Fairchild, Buhl Stinson Lincoln-Page Eaglerock, Strarman and others there were many planes of local manufacture, some of which are internationally famous, among them being Lockheed Vega monoplanes, Ryan broughams, Bach cabin monoplane and tri-engined transport, the Maximum Safety monoplane, Thunderbirds, Timm monoplane, the Joseph Kreutzer Corp "Air Coach" Federal CM-3 all-steel monoplane, the Crown B 3 and Golden Eagle sport monoplanes

Results of Contests

Charles Dycer won the 20 mi. race for OX 5 powered planes flying a Lincoln-Page biplane entered by the Dyrer Airport, Eddie Angel was second and Al Hobart, third, both flying American Eagle biplanes.

Bob Blair took first place in the Whirlwind 20 mi. race flying a Buhl Jr. Airsedan, Clarence Guenther was second in Cliff Durant's Stearman, Lee Miles finished third in a Waco biplane, and John Burnley fourth in a Monocoupe.

The dead stick landing was taken by Lee Brusse flying the Crown B-3 biplane entered by the Crown Carriage Works his distance from the line being 9 ft. 10 in. John Burnley was second in the Monocoupe, and Clarence Guenther rolled his Stearman into third place.

To Light Midwest Mail Route

OMAHA, NEB.—The Department of Commerce has announced that the lighting of the Omaha-St. Joseph airway will be begun this month. As soon as the airways are lighted, Omaha will have air-mail service from St. Louis. The contract has been let to the Robercraft Corp. of St. Louis.

Danville, Ill., Leas

DANVILLE, ILL.—An [illegible] field has been leased here by the chamber of commerce for development as an airport. The tract, which is to be conditioned in spring at which time a hangar and lighting equipment are to be installed, lies midway between Danville and Covington.

Official Airports of Entry Listed

WASHINGTON, D. C.—The Aeronautics Branch, Department of Commerce, has issued a list of airports of entry as follows: Meachem Field, Key West, Fla.; Pan-American Field, Miami, Fla.; Municipal Air Field, St. Paul, Minn.; Municipal Field, Albany, N. Y.; Escam Bron Field, San Juan, Porto Rico; Renton Field, Renton near Seattle, Wash. (formerly Bryn Mawr Field), Boeing Field, Seattle, Wash.; Los Angeles, Calif., customs house Port of Los Angeles (all ports under Los Angeles jurisdiction).

Get Permit for Airport At Valley Stream, N.Y.

NEW YORK, N. Y.—Application for a flying field for commercial and passenger service at Valley Stream, on Long Island, by the Guaranteed Aircraft Co., has received the approval of the Commissioner of Public Works.

The field will occupy 76 acres, 46 of which will be in the incorporated village of Valley Stream. The remaining 30 acres extend into Queens County.

It is the intention of the company to erect eight all metal or concrete hangars, work upon which is to be started within a month and then to construct administrative and office buildings.

Exponents of the new field claim that it is more accessible to New York than any other airport located on Long Island.

Pickwick Plans Two Lines to Los Angeles

LOS ANGELES, CALIF.—Air passenger service will be inaugurated between Los Angeles and San Francisco, and between Los Angeles and Chicago as quickly as the fleet of Bach tri-engined, 10 place transport planes can be completed and delivered to Pickwick Airways, according to a recent announcement by Charles F. Wren, president of the Pickwick Stages System and of Pickwick Airways.

Twice daily schedules are planned between Los Angeles-San Diego-San Francisco, and a daily schedule will be maintained between Los Angeles and Chicago with direct connections at Chicago for planes to New York and other Atlantic Coast cities. Present plans call for transportation of passengers from Los Angeles to Phoenix via the Pickwick Nite-Coach, a motor bus sleeper which has proved satisfactory in test runs. These large motor busses will operate between Los Angeles and Phoenix and between St. Louis and Chicago during the hours of darkness, while the Phoenix-St. Louis route will be flown by the Bach planes on a 14 hour schedule, making stops at El Paso, Dallas, Tulsa, Springfield, and Kansas City. Flying operations over these new plane-bus lines are to be under the direct supervision of Capt. William Frye.

Shaw Plans Abilene, Tex., Field

ABILENE, TEX.—This city is now planning a first rate airport, problems in connection with the layout, design, and construction having been placed in the hands of the B. Russell Shaw Co., Inc., airport engineering firm of St. Louis, Mo.

Conceives New Airport Design

An aerial perspective of the "Triarc" landing field designed by Gavin Hadden, New York engineer. Principal advantages claimed for such a field are economy of space and of runway paving. In this perspective of a 12-way field with perimeter paved for taxiing purposes, the unpaved circles at the intersections are 40 ft. across.

FOREIGN ACTIVITIES

Westland Builds Fighting Plane

Rolls Royce FXI Powers New English Monoplane of Parasol Type

LONDON, ENGLAND—The Westland "Wizard" is, apart from the enormous three-engined Beardmore "Inflexible," the first monoplane to be produced for purely military purposes in England for some time. It is of the parasol type, externally braced with an undercarriage incorporating compressed air springs and oil shock absorbers. It is powered with the new Rolls Royce FXI type, a 12 cylinder Vee with aluminium cylinder blocks and fitted with a reduction gear and producing 480 b. hp.

The "Wizard" has a span of 36 ft. 9 in., an overall length of 26 ft. 10 in., and a wing area of approximately 260 sq. ft. The empty weight, including all fixed equipment and water, is 2467 lb., and the fully loaded weight 3326 lb. The tanks give it a flight duration of 2½ hr. cruising at 15,000 ft. plus ½ hr. at sea-level. At 10,000 ft. the maximum speed with supercharged engine is 188 m.p.h. and at this height the rate of climb is 1945 ft. per min.

Tubular Metal Fuselage

The fuselage is built in two sections entirely framed in metal tubing, one from the nose to aft of the pilot's seat, and one thence to the tail. The front position is entirely of square section tube (steel for the longerons and more heavily stressed struts) joined by flat steel flitch-plates and hollow rivets. In these joints the rivets are designed to carry all working stresses, and strut ends are cut to clear the longerons. This avoids any need for undue accuracy in cutting struts to exact length and angle, and greatly simplifies production.

The rear section has longerons of square with a fixed aerial, and racks for bombs.

Swiss Increase Air Subsidy

BERNE, SWITZERLAND—An increase of 105,000 francs (approximately $21,000) in the subsidy for promotion of civil aeronautics is shown in the Switzerland Federal Budget for 1929 which calls for a total of 370,000 francs (approximately $74,000) as compared with 265,000 francs for 1928.

It is planned to extend the regular air lines of all Swiss flying services, as well as to decrease operating costs. Better air connections between Northern and Eastern Switzerland and the international air lines also are planned.

duralumin tubing, with round struts of the same material fitted into "cup" sockets held to the longerons each by a single central bolt. Over this section the fuselage is wire braced by swaged and screwended tie rods.

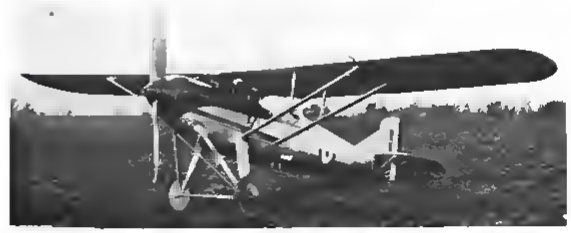
To Have All-Metal Wing

In the first plane the wing is of normal wood construction but in future models an all-metal structure will be used. No details of the type of construction are as yet available. The wing section is of a thick bi-convex type. Ailerons with horn balances shielded by the wing tip and a horn balanced rudder is used.

Two fuel tanks, each of 34 imperial gal. (41 U. S. gal.) capacity, are stowed between spars in the wing one on each side of the fuselage, causing no deformation of the wing section, and arranged so that the tanks may be dropped out of place after removing four bolts.

An undershung radiator which can be withdrawn into the fuselage is fitted just forward of the pilot's seat where it serves to warm the cockpit in addition to cooling the engine. A gear driven supercharger may be fitted to the Rolls Royce engine and the machine has been designed to accommodate this.

The military equipment provided includes two .303 calibre Vickers guns with Constantinesru synchronizing gear, sights, short wave radio sending and receiving set



England's newest military monoplane, the Westland "Wizard" is of the parasol type, externally braced, and powered with a Rolls Royce FXI engine.

Pilots a Detroiter On Goodwill Tour

Pacheco of Mexico City to Visit Many Countries South of Equator

MEXICO CITY, MEXICO—The itinerary for a projected goodwill flight and business survey that will take him into all South American countries, as well as most of the Central American countries and the islands of the West Indies, and intended, as we go to press, to start December 26, has been announced by Joaquin G. Pacheco, Mexican flier and air school and service proprietor.

The plane to be used is a Wasp powered Stinson Detroiter. In the same plane, powered at that time with a Wright Whirlwind engine, Pacheco and Fritz Beiler made the first non-stop trip between Canada and Mexico, covering the distance between Windsor, Ontario, and Tampa, Mexico, in 29 hr. 50 min. despite a 20 mi. headwind all the way. After stopping 12 min. to refuel they made the remaining distance to Mexico City, the original destination, in 2 hr. 50 min.

Represents Pioneer

Mr. Parbero, who represents the Pioneer Instrument Co. in Mexico and maintains a flying school and air taxi service at his private field adjacent to the National Balneria Field at Mexico City, seeks to promote communications and relations between the Latin American countries. He will survey the possibilities for small planes in these countries.

C. E. McMillin, former U. S. Navy pilot and last year in charge of Stinson distribution in Northern New York will be co-pilot and Tom Tomish will be mechanic.

Advise Funds for Zeppelin

BERLIN, GERMANY.—The German Government has been requested by the Reichsrat to appropriate 2,000,000 marks (approximately $480,000) for Zeppelin airship construction, and also to make further appropriations in 1929 which would insure the building of a hangar. The Reichsrat is an advisory body composed of representatives of the German states.

Order Five Ryans for China

HANKOW, CHINA.—Five Ryan Brougham monoplanes have been ordered by the Wuhan Civil Aviation Bureau, a semi-governmental organization, with headquarters here, which proposes to establish mail and passenger routes.

THE BUYER'S LOG BOOK

Consolidated Panel

A NEW type of instrument panel having several unique features has been placed on the market by the Consolidated Instrument Company of America, 11 West 42nd St., New York, N. Y. Orders for this device are now being filled for several aircraft manufacturing firms.

Each indicating instrument in the new panel is of standardized size, 2¾ in. in diameter, and encased in standardized crystals, the whole forming part of a new system of indirect lighting in which each instrument is a completely illuminated unit in itself. Because of the standardization in size, each instrument may be placed in any section of the board. Light diffusion is effected by a new patented process, while the light intensity is regulated by means of a hand rheostat, shown at the extreme right hand side of the new type of instrument board.

Consolidated Standardized Instrument Panel

This new instrument board is also said to represent an improvement from the standpoint of manufacturing costs, due to its standardization in size of panel and instruments, and the fact that a panel can be built, without additional cost, to contain as many or as few instruments as desired.

Another important factor exemplified in the new instrument board, the manufacturers point out, is that the standardization herein effected, has made for greater compactness and lessened weight. In addition the entire unit has been designed, not only for increased all-around efficiency and ease in reading, but also to aid and conform with advanced standards of attractiveness.

Lee Flying Suits

THE LINE of Aeronautical products manufactured by the H. D. Lee Mercantile Co., Kansas City, Mo., comprises six light weight suits and one heavy weight or winter flying suit. The winter flying suit is made of Lee forest green herringbone twill, an olive green color fabric, wool lined with an inter-lining of wind-proof fabric and has a snug fitting collar which also is wool lined.

Four other suits are of the sideopening type in forest green and white. Still lighter weight suits are made in an olive drab and white. A center opening flying suit in white herringbone twills and forest green herringbone twills, of which many have been supplied to the U. S. Air Corps Service, also is included in the products

Armco Subdrain Piping

IN ORDER to meet the requirements of subdrainage of runways or roadbeds, the American Rolling Mill Co, Middletown, O, has developed Armco perforated pipe. This is similar to Armco corrugated iron culvert pipe but has perforations in the valley of each corrugation for a portion of its periphery. Any desired length may be obtained by connecting succeeding sections.

Among the features claimed for this product are strength, drainage efficiency and durability. It is made of Armco ingot iron heavily galvanized.

Problems of Aeronautical Training

(*Continued from page* 2101)

actual number of students enrolled in aeronautical schools was probably twice the number given above. The increase in the number of students examined during the past three months is undoubtedly an indication of the wider effectiveness of the Air Commerce Regulations, and probably does not indicate any marked increase in the actual number of students training.

Because of the large number of schools located in all sections of the country and relatively small enrollment per school, the San Diego Air Service Corp. has adopted a selling approach in its school advertising radically different from that employed by the average enterprise.

It has been the policy to eliminate any reference to phenomenal incomes from aviation, and to stress in its advertising and publicity the more important question of thorough training. It is believed that as aviation develops there will be an increasingly large number of young men who consider the industry from a professional point of view, interested primarily in getting thorough training at a well established and efficiently managed institution.

It is planned next spring to conduct an intensive campaign among the universities and colleges of the Pacific Coast in an endeavor to enroll university students for a private pilot's course to be taken during the summer vacation. To these men, the training is offered as a practical method of becoming familiar with aviation and not as training to become commercial pilots. It has been found that many men of this type are interested in learning aviation from the operation side without having any desire to earn their living by flying.

Commercial aeronautical training has been conducted on the basis of teaching a trade. The newer approach is to teach flying as the most thorough manner of learning the fundamentals of aviation. This will bring to the aircraft industry, men of broad business training, competent to lead in its future development, with a background of practical flying.

About Glue and Gluing Practice

(*Continued from page* 2099)

Water resistance tests are usually made on 10 plywood specimens, composed of three 1/16 in. plies and measuring 1 in. wide and 3¼ in. long. Each should have two slots cut across the opposite faces ⅛ in. wide and one inch apart, each slot going through two of the plies. One half of the specimens made are tested dry, the other half after soaking in water at room temperature for 48 hr. Tests are usually made in cement briquette testing machines. The dry specimens should fail at approximately

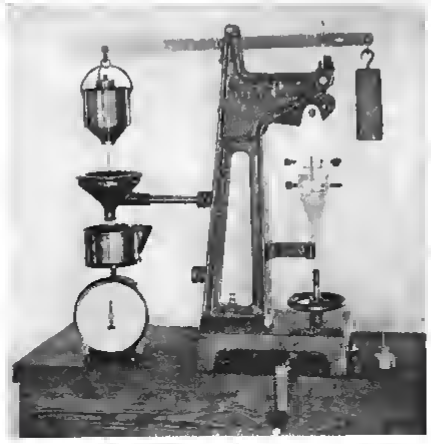
250 lb per sq in, and the wet ones about 125 lb per sq in.

Too much stress cannot be laid on care in mixing glue. All kinds of incorrect mixtures were seen during my trip, some thin, thick, lumpy, and others, full of air bubbles. Some sort of mechanical mixer having two speeds is the kind recommended. In mixing casein glue, after the amounts have been carefully weighed, the water should first be placed in the bowl of the mixer and the glue sprinkled, or sifted in slowly, with the paddle in rapid motion (100 to 120 r. p. m.) This is done because many glues become lumpy unless stirred rapidly during the first few minutes. After the dry glue has been added, the motion of the paddle should be slowed down to 50 or 60 r. p. m., and the stirring continued until all particles of casein are dissolved and a smooth mixture of even consistency results. This mixing usually requires from 20 to 30 min.

Directions Furnished by Manufacturer

With certain glues the mixture must be allowed to stand a specified length of time after the preliminary mixing. These special cases are covered in the directions furnished by the manufacturer. Stirring too rapidly beats an excessive amount of air into the mixture, which is bad in any joint, but particularly bad where high pressures are not applied to the glued joints during setting. Batches containing lumps at the end of mixing should be rejected. Attempts to beat the lumps out are not advisable, because they will usually result in a foamy glue.

In my visits, I found a number of factories in which the glue pots, both the mixing pots and the ones used by the workmen, were not cleaned out daily, resulting in very foul smelling, and, in some cases, practically worthless mixtures. Mixers, spreaders, workmen's brushes, glue pots, or cups, and all other receptacles should be thoroughly cleaned at least once during each working day to prevent deterioration of the glue, and the inclusion of old glue in freshly prepared mixtures. This rule applies to both casein and animal glues. I have seen instances, in which several hands full of animal glue flakes were thrown



The Riehle testing machine, used by the government as well as large industrial users of glue, for testing the strength of plywood.

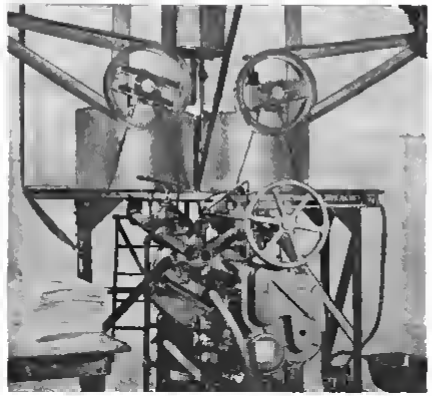
A Sport Waco in inverted flight

into the glue pot from time to time as the supply got low, with practically never a cleaning of the pot Such glue gives joints, far below the expected strength, because of deterioration due to bacteria. Animal glue which has been heated as long as four hours should be discarded.

With casein glue, paraffin-coated paper cups (drinking cups) may be used to advantage by workmen and discarded at the end of the day, or when a new batch of glue is prepared The workman, who mixes the glue, should report for work half an hour early in the morning in order that the glue may be ready for the workmen when they are ready for it Another batch of glue should be mixed during the lunch period.

Glue is spread almost entirely by hand, although a few factories are using mechanical spreaders on cap strips and, in some instances, on wing beams consisting of two pieces glued together Mechanical spreaders give a more uniform and reliable spread and reduce the personal factor. Their more essential use in aircraft construction is very desirable. The essential in spreading glue is to apply the proper amount uniformly over the surfaces to be joined At present an excessive amount is being spread on many of the surfaces, while on others the spread is insufficient and uneven. Too small a spread is more harmful than too much, but both should be avoided.

Investigations have shown that the most reliable glue joints are made under comparatively high pressures, such as 100 to 200 lb per sq in. High pressures are especially important with thick glues, such as casein glues Many cases have been found where the pressure variation is enormous, ranging from a few pounds to 400 lb per sq in, and has not been uniform over the joint. The object of pressure is to bring the wood surfaces into intimate contact with the glue, to force the air from the joint, and to spread the glue out into a continuous film between the wood layers



A factory installation of glue mixers and a glue spreader. The mixers are of the jacketed type. Note the water measuring tank above them

In much of the aircraft gluing, the pressure is applied only by nails, or screws Where the pieces are thin, this does not give uniform pressure over the joint In such cases, it is recommended that pressure be applied by means of clamps, or jack screws.

Pressure may be applied either before or after the nails or screws are used. If afterwards, the time elapsing between spreading the glue and pressing should not exceed

20 min. If pressed first it is best to allow the glue to set for at least five or six hours before inserting the nails or screws

When hard woods, such as ash and birch, are glued, greater care is necessary than when gluing soft woods like spruce. A thick mixture, pressure around 175 lb per sq. in., and a relatively short time between gluing and pressing are required.

When end grain surfaces are to be glued, these surfaces should be sized first with a thin glue. After the sizing has dried, the surfaces are ready for gluing, but a glue thicker than usual, should be employed. About 200 lb per sq. in. pressure should be used.

Glue squeezed out of a joint should be removed. This can be done with a cloth while the glue is still soft. In some instances, the finish over the glue has been known to check more than over the wood.

The recommendations made concerning the usage of various glues, it is hoped, will be of value to manufacturers. In tabulated form, the recommendations are as follows:

1. Weigh the glue and water.
2. Test all glues for strength and water resistance.
3. Mix the glue well. The glue should be dissolved and free of foam and lumps.
4. Avoid mixtures that are too thick, or too thin.
5. Do not attempt to use glue after it has become too thick to spread properly. Mix at least twice a day.
6. Keep all pots and brushes clean to prevent bacterial infection and weakening of the glue.
7. A greater use of mechanical spreaders should be made.
8. A more extensive use of pressure after gluing should be made.
9. Greater care is necessary in the proper gluing of hard woods and end grain joints of spruce and other soft woods.

Controlling the Overhead Expenses

(*Continued from page* 2098)

the article could be made at a cost that would yield a profit, but if we have omitted a large section of the expense necessary to production and sale, the estimate will be useless for that purpose. Since it is profit that interests us, we must find a way to include in our estimate a share of this omitted expense.

The older school of accounting did not pursue these indirect items very far. It was content to lump them under one or two general headings, and show them so on the annual statements. An allowance for them in estimating was then often made by adding to the base cost of material plus labor a percentage (frequently around 100 per cent.) supposedly large enough to cover the "overhead" and include a profit. This is a very crude method of estimating and costing, as the following consideration will show.

By the above method, the overhead is spread at the same percentage over the cost of material and the cost of labor, perhaps about 100 per cent. on each, but it is perfectly evident that the expenditures necessary to the purchasing, receiving, storing, and handling of the material will not amount to anything like 100 per cent. of its cost. They are, in fact, ordinarily from about 2 to 6 per cent., so this "blanket" overhead method resulted in loading on the material a highly disproportionate share of the total expense. So long as the ratio of material to labor ran about uniform in the products, this did not much matter, but when different products were introduced, in which this ratio differed greatly, the disproportionate

tion became important It resulted in setting unduly high selling prices, with possible loss of sales, on products containing much material, and unduly low selling prices, with actual loss and inflated sales, on products containing much labor. Its obvious inaccuracy has caused the general abandonment of this plan and the substitution for it of plans by which the overhead is distributed largely or wholly on the direct labor. We now turn to the investigation of such plans and of the manner in which overhead expense is really involved in cost

Indirect Items of Cost

In an earlier paragraph, there were enumerated some of the things which go to make up overhead. Though none of them can be allocated as direct items of cost to any specific piece, or operation that now appears on our estimate, each one does cover the expense of some kind of service which is necessary to the productive, distributive, or administrative functions of the business Some of them are general, such as the expense of power, purchasing, selling, accounting, and administration Others, like repairs, supplies, and supervision, can be allocated to specific buildings, departments, or machines.

A logical though impracticable way to distribute these different indirect items would be to determine what direct items will be served by each one, and apportion it among them This, however, would require not only an ability to read the future in every detail, but, by reason of that detail, an accounting and distributing force many times larger than the direct productive It does, however, indicate the logical principle that should be followed in allocating these indirect expenses

This is to determine from past experience what these groups of expenses have been and how the services they represent have been applied in direct production, and then, from a survey of conditions and expectations, to estimate what their amounts and applications are likely to be through the near future Then, with any estimate of direct costs, there will be included allowances for the costs of these services or indirect expenses, so far as in that case they apply Thus, departments that are in a building will be charged with their shares of the average expected cost of providing and maintaining it; operations that require floor space will be charged, not only with their direct material and labor, but with rental for such space at its average expected cost; operations that require power will be charged with the average expected cost of power, etc. The degree of detail to be employed in these distributions may be much or little according to conditions and desired results.

Grouping the Items

The first great grouping of these indirect items will be according to the services they render in supply, production, distribution, and administration. That is, into purchasing and stores expense, factory expense, selling expense, and administrative expense. In some cases, no finer subdivision is required. Let us assume that the books have been arranged to give these classes of expense, and that business conditions are reasonably stable—that experience of the recent past may be taken as applying to the near future We may then find that, during that recent past, the purchasing and stores expense has been a certain fraction of the cost of materials used, that factory expense has held at a certain per cent of the direct productive wages, and that selling and administrative expenses have maintained certain relations to the amount of business done Under the stated conditions, it will be safe to assume that these relations will hold, and to use

them in adding, to the amounts of the different items in our estimates, allowances for these different classes of expense. This is the simplest formula that can safely be used in the distribution of overhead. As a means of building up to selling price and profit, it is as follows:

The sum of cost of direct material plus overhead on material and cost of direct labor plus overhead on labor equals the factory cost of goods. By adding this sum to the selling overhead and administrative overhead, we find the cost as sold, and by adding profit, the selling price is determined.

It will be interesting to compare the results obtained by this formula with those given by the "blanket" overhead formerly in vogue. The following tabulation shows such a comparison for two hypothetical products, "A" and "B," having quite different ratios of direct material and labor.

Cost and Profit by Simplest Correct Formula

	Product A	Product B	Total
Direct material	$ 80	$ 20	$100
Overhead on material at 5 per cent	4	1	5
Direct labor	20	80	100
Overhead on labor at 75 per cent	15	60	75
Factory cost of goods	$119	$161	$280
Sales overhead at 20 per cent of factory cost	24	32	56
Administrative at 10 per cent. of factory cost	12	16	28
Actual cost, as sold	$155	$209	$364
Profit, 10 per cent on cost or 9 per cent on sale	15	21	36
Proper selling prices	$170	$230	$400

Cost and Profit by Blanket Plan

Direct material (as before)	$ 80	$ 20	$100
Direct labor (as before)	20	80	100
"Bare cost"	$100	$100	$200
Allowance for overhead and profit at 100 per cent	100	100	200
Selling prices by blanket plan	$200	$200	$400
Excessive price on product "A" by blanket plan	30		
Actual loss on sale of product "B" by blanket plan		$9	

It is seen that the blanket plan, although giving the same apparent result for the total business, gives quite incorrect results on the individual products. While the examples chosen perhaps represent extremes, they are neither impossible nor even unlikely, and well illustrate the danger of making up costs and prices by an improper method of overhead distribution. Its use, in such cases as the above, would probably result in getting a flood of unprofitable business, "B," at the low price, while all the profitable business, "A," would go to competitors. There is little doubt that many business failures resulted, in earlier days, through the use of the blanket overhead, from just this cause. Although now nearly obsolete, it does persist here and there, and a pernicious case of it came to the writer's attention but a short while before this article was written.

The next phase of this subject has to do with the overhead on direct labor and the effect on costs of varying departmental conditions. This will be discussed by Mr Douglas in his next article, which will appear in an early issue

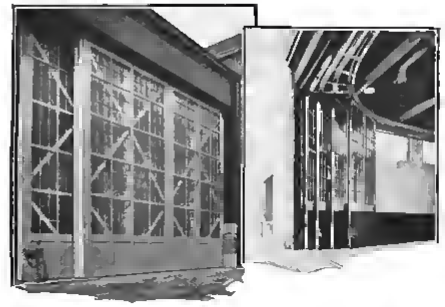
Building the R.101

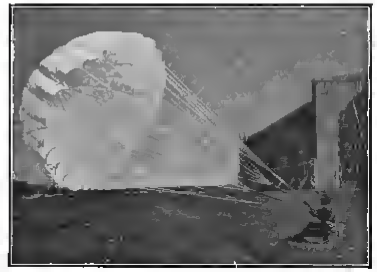
(*Continued from page 2097*)

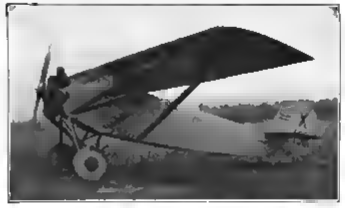
change in the qualities of the steel. Other grades of H.T. steel, of equal tenacity, can however be drawn at higher speeds and duralumin at higher ones still.

(It should be pointed out that solid drawn tubes in any material, and of the guages which can be produced by this process are not obtainable.)

The formed tube leaves the draw bench perfectly straight and free from twist and then passes to the heat-treating benches. These are precisely similar to the draw-benches, but have two die-heads, with between them electrically-heated resistance-type muffle furnaces. The first die merely provides enough friction-grip on the tube







to ensure that is shall be kept straight in the furnace by the drawbench pull The tube passes through the furnace, is raised to hardening temperature and, soaked for a predetermined period, emerges from the furnace, is air-quenched, and then enters the second die, which is hollow and has passing through it a stream of cold water This die completes to cooling

Time of "Soak" Controlled

The temperature of the furnace is maintained at somewhat above the hardening temperature of the material and regulation of temperature of the tube, and of the time of "soak" is controlled by the speed of passage of the tube through the furnace The hardening temperature of the particular steel used for R 101 is 960 deg—1,000 deg C depending on the exact composition and micro-structure of the particular batch of strip being treated. The precise conditions required for satisfactory results vary with differents casts of steel, with each annealing temperature used and, naturally, with the mass of metal per foot run of each particular section It has nevertheless proved possible so to control this process as to secure very uniform quality in the finished sections.

It should be noted that these difficulties are not encountered to nearly the same extent with steels of other than this particular stainless type

The boom sections of stainless steel are rolled in a multiple spindle rolling mill at one pass at higher speeds than can be attained by drawing and are then heat treated in exactly the same manner

In its final state the steel thus formed and treated has an ultimate tensile stress of 88.93 tons per sq in, a "proof stress" of not less than 65 tons and will bend 180 deg with cracking at a radius of three times its own thickness. ("Proof" stress is that stress at which the extension of a test piece departs by .5 per cent. from direct proportionality.)

Duralumin sections are all heated to 480 deg $C_{.}$ quenched and worked during the first two hours of age-hardening, the annealing process not being used

Tubular and boom sections of this material are drawn or rolled precisely as are the steel sections. The standard duralumin webs are a simple two operation press job

Very great care has been taken to ensure adequate protection of all parts not of stainless steel against corrosion All duralumin components are first treated by the anodic oxydization process and then coated with lanolme.

Process Not Found Entirely Satisfactory

In certain quarters, and especially in the United States it has not been found that this process is as uniformly satisfactory as might be desired* This is possibly due to lack of sufficient experience with the process, for it has been found that very careful control of current density, rate of voltage rise, period of soak, and concentration of electrolyte are necessary to ensure good results, and that the details required to be modified with minor changes in composition of the alloy, and with changes in the condition of surface—whether machined, as stamped, pickled, etc. After dealing with many thousands of sq. ft. of light alloy by this process, Boulton & Paul are now able to ensure excellent and uniform protection

Incidentally, the anodic process has considerable value as an inspection agent Any variation in the structure or composition of the material leads to selective attack by the electrolyte, and cracks, flaws and the like, undiscoverable otherwise, can be seen after treatment

(Continued on page 2126)

**Practically all manufacturers in the United States are using "Alclad," which apparently does away with the necessity of treating duralumin by the anodic oxidization process.—The Editor*

Non-stainless steel fittings are zinc-coated by a zinc vapor process, really a modified and controlled "Sherardizing" process. This form of protection has also given trouble in the past from lack of uniformity in its results, but Boulton & Paul claim that it is now possible to ensure that the zinc shall be definitely alloyed to the steel, non-porous to the most severe tests yet known, and that the change in dimensions of an article thus coated shall be kept to within the limits of .003 in and .006 in.

The aluminum-silicon alloy, used in the die-cast condition, has been found to have such excellent resistance to corrosion that no special treatment is considered necessary.

A detail of some interest in this ship is the method of securing the ends of the bracing cables It was desired to make these to dead length, and to adopt a type of cable and of end-fitting which should be stretch- and "creep"-

The jig for drilling joint holes on ridge girder joint stampings used in the British dirigible R 101.

proof. After many tests it was decided to use galvanized H.T. steel wire in the form of single-strand cables, fitted with terminals of the type embodying a coned nipple into which the frayed-out end of the wire was locked by a cone of cast-in fusible metal.

Terminals of this type, filled with ordinary soft solder, have frequently been used in the past, but were found to creep and "bed down" under load to an excessive and irregular extent. Moreover there is a definite risk of corrosion when solder is used, owing to the type of flux which must be employed

Finally the firm's research laboratory developed "Cazin," an alloy of 82.6 per cent. Cadmium, 17.4 per cent Zinc, which has been used as a solder on all the cables of R.101 The melting point of Cazin is 263 deg C., insufficient to damage the steel of either cables or sockets; it needs only a very little rosin as flux, and it has a shear strength of 7 tons per sq. in. Moreover it is electrochemically so near akin to the zinc with which both cables and sockets are coated as to remove any risk of electro-chemical corrosion.

From this necessarily desultory account of some of the many novel characteristics of R.101 it will be realized how great a volume of research and experiment have been expended on her design and construction. The question inevitably arises as to whether the time and money expended on this work can possibly be justified by the result.

(*Continued on page* 2128)

The answer is shortly, Yes. All experience, in Great Britain at any rate, has gone to show that the light alloys of the duralumin type are by no means uniformly reliable structural materials. The position in Britain is complicated by the fact that supplies of bauxite for the production of aluminum must be derived from abroad. Steel on the other hand is a home-grown product, and if steel of 80-90 ton/sq. in. ultimate strength can be used in such forms as to develop its full strength effectively, it becomes a material at once more certainly available, more reliable, and at least as light as duralumin.

Large Amount of Research in Steel

An enormous amount of research and experimental work has therefore been directed in Britain to the development of aircraft structures of steel. These developments have been so far successful that today steel wing spars,—lighter than spruce—are in regular use, even for machines of the "pursuit-ship" class. These spares are definitely production parts—the component parts come off the drawbench or the rolls, are assembled by semi-automatic machinery, and require less labor to produce than do the corresponding wood members.

Plant and equipment to produce them are expensive, but their productive capacity is far beyond that required for the present demand. And the cost of design of a new type of aeroplane of this construction is high—simply because the drawing office can lesve nothing to be "fixed up on the job."

But even today, once a given design has been accepted it costs less to build the steel machine than the wood one. Complete interchangeability of components is assured automatically by the methods of production employed, and assembly becomes a job for semi-skilled labor.

The design of R 101 has made use of existing plant and knowledge gained in developing the British type of steel structure for airplanes. The cost of carrying out the very intricate detailed design work has been high, but that design work has been so skilfully done, that manufacturing costs have been remarkably low.

If the need ever arises—it is perhaps unlikely—to produce a duplicate of R 101 the cost of manufacture will not greatly exceed that of the old R 34 of less than half the size, produced during the War by a process of copying Zeppelin practice. The result of this very successful experiment in manufacture is that Great Britain can face the problems of future airship construction with greatly increased confidence, knowing that the use of steel is definitely a practical proposition.

Closed-Joint Tube Section Standard

Quite apart from this it has been shown that the type of metal construction which has been developed in Britain primarily for airplane purposes is elastic enough to meet requirements far beyond those originally contemplated, and that the equipment of the factories engaged in this class of work is suitable for almost any possible development of the near future. In this connection it is well to point out that the works of Boulton & Paul have produced for R 101 about 25 mi. of the special closed-joint tubing used in the airship, and that there are over 12 mi. of girder in the hull frame. All these members have been produced in a plant which was laid down for airplane work, and has been in use continuously for this purpose even while the airship was under construction. The closed-joint tube section is in fact a standard, and is used by this firm—in a somewhat different steel—for airplane fuselages.

SIDE SLIPS

By ROBERT R. OSBORN

As this is the last issue of AVIATION before the New Year, we might as well make our annual resolution to get the copy for this column in on the day the editor thinks it should be in. So, Mr. Editor, please consider the resolution as moved, seconded and carried unanimously.*

**The annual apology is accepted which automatically entitles Mr. Osborn to not more than 53 late deliveries of copy during 1929.—The Editor*

* * *

Many newspapermen seem to have the failing of missing the real points of the stories they report. A recent example of this came when Miss Viola Gentry broke the woman's endurance record for airplanes, previously held by Lady Heath. The reporter, of the account we read, gave a lot of uninteresting details about the distance of the run for the take-off, the number of gallons of gasoline carried, actual flying time, etc., and then casually stated that "Miss Gentry, bundled into several layers of warm clothing, taxied her plane to the head of the runway." The news that thousands of his readers were so anxiously awaiting, he fumbled completely—that is, did Miss Gentry break Lady Heath's record for wearing four flying suits and a leopard skin coat, or does that record still stand?

* * *

Also in the account of Miss Gentry's record breaking flight we read, "At eight o'clock she dropped her first message, written on a slip of paper and tied to a wrench." As we know a number of young ladies who are flying, or learning to fly, and knowing that this method of sending a message is likely to appeal to their romantic natures, we have a request to make. If, by chance, any of them should have messages for us, we have a marked preference for telegrams, or mailed letters. However, if the message must be dropped from the air, we'd like to suggest tying it to, say, a cotter pin for a weight.

* * *

Mr. G. A. W. of Curtiss Field, Long Island, N. Y., sends in the following clipping from an article by Major H. O. D. Segrave in the London Daily Mail:

"On leaving Croydon the machine rose to a height of 400 ft., which it maintained until we reached Calais, and then the pilot reduced his height to 150-180 ft., at which height he flew all of the way to Berlin. As an old pilot myself, this worried me considerably because of the fear of engine failure and not having sufficient height to be able to choose a field to glide down and land in. However, after a talk with the wireless operator my fears were dispelled."

Mr. G. A. W. comments that it would take some sweet operator to dispell his fears of a forced landing from 150 ft., but admits that a talk with Clara Bow, for instance, might make him forget anything.

* * *

WILL TRADE

Four pairs cheap goggles, six wing insignia pins, showing membership in "aeronautic" societies, and one helmet suitable for football wear, all new Dec. 25, 1928, for crack-up fittings of "Jenny" or parts of OX motor. Write Intrepid Aviator, care AVIATION

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This new Tachometer is a typical Pioneer development. Sample instruments have been in service on our own test airplanes for the past three years. The first production instruments were installed on a score of commercial airplanes in regular daily operation and their performance noted by our engineers. All reports being favorable, the Tachometer is now offered to the aircraft industry as a worthy addition to the famous Pioneer Line.

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